PRELIMINARY INVESTIGATION OF TRACE CONTAMINANTS IN PULP AND PAPER MILL EFFLUENTS

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Ministry of the Environment

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PRELIMINARY INVESTIGATION OF TRACE CONTAMINANTS IN PULP AND PAPER MILL EFFLUENTS

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FOREWORD

The data presented in this report largely result from a joint program, undertaken in 1982 by the Great Lakes Section, Water Resources Branch and the Industrial Abatement Section, Northwestern Region, in an attempt to investigate pulp and paper mill effluents with respect to trace contaminants. The results presented have to be considered as preliminary, since most are based on single grab samples and cannot be assumed to be representative of these effluents. This was a first attempt at this type of study on pulp and paper mill effluents and the results will provide information upon which further studies can be based.

Additional data, collected in 1983, as part of the Ministry's Lake Superior intensive year investigations of Nipigon Bay, under the Great Lakes Surveillance Plan of the International Joint Commission, and as part of a joint assessment by the Northwestern Region and the Toxicity Unit, Water Resources Branch of the acute effects of mill effluent on caged fish in Jackfish Bay (Flood et al. 1986), are also presented in this report.

Since 1982 and 1983, significant changes have taken place at many of the mills investigated which would affect effluent quality and the type of constituents that might be present in these mill effluents.

The Ministry has recently issued a White Paper to secure public input on a Municipal-Industrial Strategy for Abatement for Ontario, that places emphasis on the control of toxic substances. The information obtained through this study will be useful in formulating further monitoring requirements and additional control measures for pulp and paper mill effluents.

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SUMMARY

Pulp and paper mill process streams from a number of mills located in Northwestern Ontario were sampled in order to establish a preliminary inventory of effluent constituents.

Samples were analyzed for both conventional (e.g. solids, conductivity, turbidity) and non-conventional (e.g. chlorophenols, trace metals, pesticides) parameters using a number of analytical techniques. Physical, chemical and biological characterization included the examination of: bacterial densities; acute fish lethality; inorganic trace contaminants; fatty, aromatic and resin acids; speciated phenolics and chlorophenols; volatile organohalides; PCB's; organochlorine pesticides and additional trace contaminants.

The results of this study revealed high levels of conventional pollutants in mill effluents, when compared with mill intake water. In addition, hazardous organic and inorganic trace contaminants with the potential for causing fish tainting, taste and odour problems in drinking water supplies, and toxicity to aquatic organisms were identified as constituents of some of the mill effluents examined. Chemicals, potentially mutagenic and/or carcinogenic, were also found.

A number of sampling and analytical problems were encountered during the course of this study which contributed to the high degree of variability of results observed between and within mills. These included: small sample sizes; a lack of mill operating information; and the absence of established sampling and analytical protocols.

As a preliminary step in effluent characterization, this study has provided a lengthy list of chemicals and concentrations determined to be present in some of the pulp and paper mill effluents. In order to determine short-term variations and long term trends, and obtain a better understanding of the overall input of these chemicals to surface waters, a more comprehensive survey is needed. This would include continuous monitoring for longer periods of time to encompass all phases of mill operation during typical and atypical conditions and the use of consistent established sampling and analytical protocols.

INTRODUCTION

Pulp and paper mill process wastes are known sources of conventional and non-conventional water pollutants. Various organic and inorganic trace contaminants capable of causing fish tainting, taste and odour problems, lethality and/or bioaccumulation in fish and other biota have previously been identified as constituents of mill effluents.

In 1982, a study was undertaken by the Great Lakes Section, Water Resources Branch, and the Industrial Abatement Section, Northwestern Region, as a preliminary step in characterizing effluents from selected Ontario pulp and paper mills. The purpose of the survey was to initiate compilation of an inventory of effluent constituents and to establish a data base, for the Ministry's Lake Superior intensive year investigations which were planned for 1983, under the Great Lakes International Surveillance Plan (International Joint Commission (IJC) Water Quality Board). An inventory of this type had not been undertaken previously in Ontario and no established sampling or analytical protocols were available.

The information provided in this inventory will also be essential to Ministry of the Environment staff addressing environmental impact, abatement, regulation and control of pulp and paper mill waste discharges.

DESCRIPTION OF MILLS

A total of nine mills located in Northwestern Ontario, of which seven discharge either directly or indirectly into Lake Superior, were examined. The mills, their location, the types of processes employed and the average daily production and effluent data for 1982 are presented in Table 1.

METHODS

1. Sample Collection

Single grab or composite samples of final mill effluents, individual process streams or mill intake water were collected from each mill as outlined in Appendix A. In the case of Domtar Packaging, Red Rock, sampling for final mill effluent also included treated effluent from the Red Rock Water Pollution Control Plant (WPCP). It was not possible to sample the mill effluent alone, as it is discharged as three separate streams into a collection canal, one above the WPCP discharge, and two below.

2. Sample Analysis

Mill samples were analyzed for a variety of parameters which are listed in Table 2. The analyses were carried out by Ministry of the Environment (MOE) laboratories in Thunder Bay or Toronto as described in the Handbook of Analytical Methods for Environmental Samples (MOE 1983). Aerated, static, 96-hour bioassays with rainbow trout, to determine the acute lethality of the effluents were conducted by the Toxicity Unit of the Water Resources Branch (Craig et al. 1983).

Gas chromatographic/mass spectrometric analyses were also conducted on a selected number of samples from each mill by the Mass Spectrometry Unit of the MOE and the Analytical Services Division, of the Environmental Protection Service, Environment Canada. Compounds were identified on the basis of computer matches with the NIH/EPA Library. The designation of isomers, where indicated, has not been confirmed.

RESULTS

The results of the 1982 sampling program, along with some additional 1983 effluent data for Domtar and Kimberly-Clark, the latter of which formed part of a joint 1983 Northwestern Region and Toxicity Unit in-situ fish study, are summarized in Tables 1-72 (Appendix B).

In the absence of established effluent standards or guidelines for many organic and inorganic trace contaminants, the concentrations of these compounds detected in the mill effluents examined were compared with objectives, guidelines and/or criteria for surface water quality. This was done in order to put the concentration values detected in mill effluents into perspective and lend some appreciation to the values observed. However, these receiving water objectives should not be used directly to assess effluent quality.

A brief discussion of the key findings provided by this program are presented below:

1. Physical, Chemical and Biological Characterization

Samples for physical, chemical and biological parameters were taken from various final mill effluents, mill intake water and individual waste process streams (Tables 1-9, Appendix B). These samples revealed considerably elevated levels of most of the parameters examined in mill effluents when compared with mill intake water. The ratio of final mill effluent concentration to intake water concentration was a maximum of 10,000 for reactive phenolics, 5,000 for BOD, 490 for COD, 300 for tannins, 250 for sodium, 140 for DOC, 80 for suspended solids and 50 for colour.

As expected, due to the semi-continuous nature of the mill processes and the complexity of the raw materials, a high degree of variability was found between effluents of different mills and to a lesser extent between effluents of the same mill. For example, concentrations of reactive phenolics in final mill effluents ranged from <1.0 ug/L at the Abitibi Price Fine Papers mill to 3400 ug/L at Kimberly-Clark and BOD levels ranged from 55 mg/L at the Abitibi Price Fine Papers mill to 540 mg/L at Abitibi Price Thunder Bay and Kimberly-Clark. Similarly, reactive phenolics ranged from 120 ug/L in a James River final effluent sample collected in June to 2600 ug/L in the same effluent stream sampled in August. However, the level of BOD and suspended solids in the same two samples decreased from 280 to 240 mg/L and 230 to 30 mg/L, respectively.

The current Provincial Water Quality Objective (PWQO) for the protection of aquatic life and recreational water uses, for reactive phenolics (as measured by the 4-aminoantipyrene colorimetric test) is 1 ug/L (MOE, 1978). Thus, the final effluent with the highest concentration of phenolics would have to be diluted by 1:3400 (i.e. 1 part effluent to 3400 parts receiving water), in order to meet the PWQO in the receiving water. The actual dilution for the Kimberly-Clark effluent in Jackfish Bay has been estimated to be 1:20 at about 6km from the point of discharge.

2. Bacterial Densities

High densities of bacteria were encountered at all of the mills examined, with the exception of James River Marathon Ltd. In decreasing order of abundance, the types of bacteria identified were heterotrophs, total coliforms, sulphate reducers, fecal coliforms or fecal streptococci, and Escherichia coli (E. coli) or Pseudomonas aeruginosa strains. The levels of bacteria in final mill effluents ranged from <10 E. coli or Pseudomonas aeruginosa organisms/100 ml to 6×10^7 heterotrophic bacteria/1 ml. The results are presented in Tables 10 - 18, Appendix B. These levels are typical of those found in pulp and paper mills throughout North America.

3. Inorganic Trace Contaminants

Low levels of heavy metals and other inorganic substances were found in all of the effluents (Tables 19 - 27, Appendix B). Concentrations of copper, iron, zinc and hydrogen sulphide in final mill effluents were higher than the Provincial Water Quality Objectives (PWQO) for the protection of aquatic life (MOE 1978) in almost all of the final mill effluents examined (Table 3, page 17); whereas, arsenic was below the Provincial Objective in all cases. Cyanide levels were similarly low and in all but one final effluent sample were below the corresponding receiving water objective. All ten final effluent samples with detectable amounts of cadmium had concentrations greater than the MOE Objective; and three samples contained chromium and/or nickel above the PWQO's.

Based on estimated dilution ratios, which were calculated, where possible, for effluents containing the highest concentration of compound, mixing of the effluents with the receiving water would be sufficient to bring the concentrations of copper, zinc and cyanide to below Provincial Objectives (Table 3, page 17). However, dilution alone, would not be enough to reduce the highest levels of cadmium, iron and hydrogen sulphide to meet PWQO's.

All of these inorganic trace contaminants, with the exception of iron and hydrogen sulphide, are included in the United States Environmental Protection Agency's (USEPA) Toxic Pollutant List (Keith and Telliard 1979) and the MOE List of Chemicals for Further Evaluation (MOE 1982). In addition, USEPA has established best available technology economically achievable (BAT) effluent limitation guidelines for the pulp, paper and paperboard industry which control the discharge of zinc, along with two other toxic pollutants, namely, trichlorophenol and pentachlorophenol, into the aquatic environment (USEPA, 1982). Further research is required to determine the environmental implications of the observed concentrations of the various inorganic trace contaminants in natural systems.

4. Fatty, Aromatic and Resin Acids

Analyses of mill effluents and intake water for fatty, aromatic and resin acids revealed high levels in almost all effluents examined (Tables 28-36, Appendix B). Concentrations of fatty acids in final mill effluents ranged from ND to 4800 ug/L of linoleic acid; aromatic acids ranged from ND to 300 ug/L of benzoic acid; and resin acids from ND to 23,239 ug/L of neoabietic acid.

A high degree of variability was observed between final effluents from the same mills collected on different dates. Fatty, aromatic or resin acids were not detected in final effluents collected at Abitibi Price, Thunder Bay Division, on July 21, 1982, or at Kimberly-Clark in August 1982. Yet all other final effluent samples collected at these mills contained quantities of acids in concentrations upwards of 8066 ug/L.

Some of the final mill effluents examined, contained pimaric, sandaracopimaric, isopimaric and abietic resin acids, at concentrations well above those reported to be lethal to 50% of test fish (LC_{50}) in 96 hours (Table 4, page 18). In particular, abietic acid, at concentrations up to 14 times greater, was detected above the 96 hours LC_{50} dose for rainbow trout in 10 out of 25 final effluents tested. However, oleic, linoleic and dehydroabietic acids were always detected below reported lethal concentrations.

Resin and fatty acids are considered to be the principle substances responsible for toxicity to aquatic organisms from pulp and paper effluents. Some of these compounds have also been listed in the literature as "suspected" carcinogens (oleic acid) or "possible" carcinogens (abietic, dehydroabietic, isopimaric, pimaric, sandaracopimaric, linoleic, and linolenic acids) (B.C. Research 1979). Neoabietic acid has been identified as a mutagen (Douglas

and Nestmann 1980) and abietic acid has been nominated to the National Cancer Institute's Chemical Selection Working Group as a candidate for carcinogenesis bioassay (Sigman et al. 1984). As with inorganic trace contaminants, further research is required to define the environmental implications of the resin, aromatic and fatty acids detected in these samples.

5. Speciated Phenolics and Chlorophenols

Certain phenols and phenolic compounds can cause fish tainting and taste and odour problems in public water supplies; can be highly toxic; and can bioaccumulate in aquatic organisms. In addition, phenol and chlorinated phenols have been included in a list of suspected carcinogens identified in pulp and paper mill effluents (B.C. Research 1979).

Screening of mill effluents and mill intake water for specific phenolic compounds resulted in the detection and identification of phenol, vanillin, homovanillic acid, guaiacol, acetovanillon, vanillic acid and acetosyringone in mill effluents (Tables 37-45, Appendix B). Additional analyses of effluents for chlorophenols revealed the presence of tri-, tetra- and pentachlorophenols (Tables 46-54, Appendix B). Analyses of mill intake water revealed only 2,4,6-trichlorophenols in two mill intake samples out of 22 examined. No other phenolic compounds were detected in any of the mill intake waters analyzed.

Guaiacol, ranging from ND to 1250 ug/L was detected at concentrations capable of causing fish tainting (>100 ug/L) in 58% of final mill effluents examined (Shumway and Palensky, 1973). Phenol (ND to 17,000 ug/L) was detected at 3 out of 9 mills tested. One mill had detectable levels of phenol (50 - 2600 ug/L) in 75% of its final mill effluents.

All values of phenol found in final mill effluents were below the highest concentration not impairing the flavour of fish (5600 ug/L) (Shumway and Palensky 1973). Figure 1 highlights guaiacol and phenol concentrations detected in selected samples of final mill effluents from every mill examined.

The concentrations of trichlorophenols (TCP's) in final mill effluents ranged from ND to 16,200 ng/L for 2,4,6-TCP which was below the lowest acute toxicity reported for bluegill fish (320,000 ng/L) and the MOE surface water criterion (18,000 ng/L) for total trichlorophenols (McKee et al. 1984). Tetrachlorophenols (TTCP's) in final mill effluents ranged from ND to 1600 ng/L for the 2,3,5,6 isomer, which was also below the lowest reported acute toxicity of 170,000 ng/L for bluegill fish (McKee et al. 1984). However, two out of eight final effluents with detectable amounts of either TTCP isomer, had values at or above the MOE surface water criterion of 1000 ng/L for total tetrachlorophenols (McKee et al. 1984).

Fifty-nine percent of final mill effluents analyzed for pentachlorophenols (PCP's) had detectable levels ranging from 100 to 2250 ng/L PCP. Seven final mill effluent samples had concentrations greater than the MOE criterion of 500 ng/L PCP for surface water (McKee et al. 1984) and the recommended Great Lakes Water Quality Agreement (GLWQA) objective of 400 ng/L (IJC, 1980).

Dilutions of 1:6 and 1:4.5 of the effluents with the receiving water would be required to bring the highest concentrations of tetrachlorophenols and pentachlorophenols, respectively to within PWQO. The actual dilution for the Kimberly-Clark effluents containing the highest levels of these compounds has been estimated to be 1:20 at 6 km from the point of discharge.

It should be noted that samples collected before 1984 were occasionally contaminated with pentachlorophenol from damaged bottle caps. This contamination, where present, was generally in the range of 50 to 300 ng/L. Tri- and tetrachlorophenol levels were not affected by this potential source of contamination.

No PCP was detected in any of the 22 mill intake samples collected in this study. Fourteen of 21 mill effluent samples with detectable PCP levels also had detectable levels of tri- and/or tetrachlorophenols and 11 of the effluent samples contained concentrations of PCP greater than 300 ng/L.

These results lead us to conclude that, while there is some potential for contamination in these samples, there is equally strong evidence that PCP was present in the effluents examined. As a result, all PCP values as originally reported by the laboratory have been included in this report.

Effluent limitation guidelines and standards, promulgated by EPA in 1982 for the pulp, paper and paperboard industry, included trichlorophenol and pentachlorophenol on the list of toxic pollutants (USEPA 1982). Figure 2 illustrates concentrations of chlorophenols detected by electron capture gas chromatography in selected samples of final mill effluents from each mill. Again, further research is necessary to define the environmental implication of the observed concentrations.

6. Volatile Organohalides

Mill effluents were tested for volatile organohalides (Appendix B, Tables 55-63). The results show that chloroform (ND - 4036 ug/L) was detected in final mill effluents at 7 out of 9 mills examined (Figure 3). In addition tetrachloroethylene (10 ug/L) and dichlorobromomethane (9 ug/L) were each identified once in final mill effluents.

The Great Lakes Water Quality Agreement identified chloroform as a hazardous polluting substance (IJC 1978). It appears on the USEPA Priority Organic Pollutants List and on the MOE List of Chemicals for Further Evaluation. Chloroform is also a confirmed animal carcinogen (B.C. Research 1979, DHHS 1981) and suspect of carcinogenic potential for man (ACGIH 1984).

7. Polychlorinated Biphenyls (PCB's) and Organochlorine Pesticides

Results of analyses for PCB's and organochlorine pesticides showed that PCB's, in final mill effluents (ND to 2210 ng/L) were detected at 3 of the 9 mills studied and that only one mill intake water sample contained PCB's (30 ng/L). All of the samples with detectable levels of PCB's exceeded the MOE aquatic objective of 1 ng/L. A greater than 1:2000 fold dilution of the effluent, containing the highest concentration of PCB's, would be required in order that the PWQO for PCB's could be met in the receiving water. The actual dilution for this effluent has been estimated to be 1:20 at the diffuser outfall.

Six organochlorine pesticides, out of 21 screened, ranging from ND to 28 ng/L, were detected in mill effluents and/or intake water. These were: α -, β - and γ- BHC; γ-chlordane; dieldrin; and pp-DDE. The results are presented in Appendix B, Tables 64-75. The sources of the PCB's and organochlorine pesticides isolated in mill effluents and mill intake water are unknown, although these compounds have been detected throughout the Great Lakes basin.

8. Trace Contaminants Identified in Pulp and Paper Mill Effluents in Ontario

All organic and inorganic trace contaminants detected and identified in final mill effluents and individual waste process streams, from the nine mills investigated in this program are presented in Table 5. This list is comprised of those compounds which could be fully identified (i.e. on the basis of chemical class and chemical formula) by GC/MS or other routine analytical methods. Those contaminants whose chemical class could not be determined but to which chemical formuli could be assigned, are shown in Table 6. Additional compounds were detected by GC/MS; however, identification was not possible.

The trace contaminants identified in this program were compared with published lists of trace contaminants of concern and lists of compounds identified at other pulp and paper mills. As shown in Table 5 (page 19), the majority of compounds could be found on at least one of the published lists and many appeared on all six. Eighteen compounds, including benzene, chloroform, mercury, PCB, penta- chlorophenol, phenol, 2,4,6-trichlorophenol and toluene, appeared on the USEPA Priority Pollutants List, the MOE List of Chemicals for Further Evaluation, and in Appendix #1 (Hazardous Polluting Substances) or Appendix #2 (Potential Hazardous Polluting Substances) of the Great Lakes Water Quality Agreement.

In Table 7 (page 31) the organic and inorganic trace contaminants, identified in the pulp and paper mill effluents investigated in this program have been arranged into groups, based on their classification or suspected origin.

CONCLUSIONS AND DISCUSSION

The program described in this report was set up in order to establish an inventory of pulp and paper mill effluent constituents to aid surveillance and monitoring activities in mill-impacted areas along the Great Lakes and in the Northwestern Region of Ontario. The information provided in this inventory will also be of use to Ministry staff and others, especially those addressing environmental assessment, establishing regulations and control orders for the pulp and paper mills, setting Ministry policy and developing objectives and guidelines.

The study characterized a number of pulp and paper mill effluents at nine mills located in Northwestern Ontario. Results revealed high levels of many parameters relative to intake waters. These include bacteria and conventional pollutants such as BOD, total solids and sodium at most of the mills investigated. Also identified in mill effluents were organic and inorganic trace contaminants capable of causing: fish tainting and taste and odour problems in municipal water supplies (e.g. phenol, quaiacol); toxicity to aquatic organisms (e.g. heavy metals, resin acids, fatty acids,

chlorophenols); mutagenicity (e.g. neoabietic acid); and confirmed, suspected or possible carcinogenicity (e.g. benzene, chloroform, α -terpineol, abietic acid, linoleic acid, PCB, phenol and chlorinated phenols). Possible sources of these contaminants are naturally occurring wood chemicals, lignin degradation (natural or process-related), chlorination and sulphite processes, industrial solvents and additives, or solvents associated with pesticides commonly detected in the Great Lakes basin.

Many of the trace contaminants identified in this study, also appear on a preliminary, short list of pulp and paper effluent constituents (Table 1, Appendix C) which was prepared after this study was completed. This list highlights some of the trace contaminants of special concern that should be included in any pulp and paper effluent monitoring program. All of the compounds listed, were screened for in this study with the exception of 2,3,7,8-tetrachlorodibenzodioxin (TCDD), other polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF). These latter compounds were added to the list only recently, as a result of occasional detections of 2,3,7,8-TCDD in fish caught downstream of pulp and paper mills (Allan Johnson, MOE, personal communication). However, a program to investigate the presence and source(s) of 2,3,7,8-TCDD and related compounds, namely other PCDD's and PCDF's in Ontario pulp and paper mills and the surrounding aquatic ecosystems is currently underway. The results of this program should determine whether it is necessary to include these compounds in any long-term monitoring programs in the future.

In the absence of specific effluent guidelines or standards, the levels of some of the trace contaminants identified in mill effluents were compared to available Provincial ambient water quality objectives in order to determine the significance of the trace contaminant data. Most of the contaminants analyzed were generally found at very low concentrations requiring zero or minimal dilutions to achieve ambient water quality objectives. However, dilution alone would probably not have been enough to reduce the highest levels of cadmium, iron, hydrogen sulphide, or PCB's, encountered in some of the final mill effluents investigated, to meet PWQO.

A considerable amount of variability of concentration and chemical composition was observed between effluents of different mills and effluents of the same mill. This could be due to differences in mill type (pulp and/or paper); state of mill operation (normal or abnormal); production (maximum or other); pulping processes employed (kraft, sulphite or mechanical); type of furnish used (hard or softwood, or re-cycled paper); type and performance of pollution abatement measures practised (clarifiers and/or lagoons); type and timing of sample and sampling procedure (grab or composite); or analytical methods employed (see Table 1, for example).

Sampling and analytical methodologies varied throughout the study period. These variations resulted from a lack of available established protocols. Sampling procedures were amended and more reliable analytical methods were adopted during the course of the program.

It must be emphasized that the sampling program described herein was not intended to be a comprehensive inventory of all mill effluent constituents under all operating conditions. Nevertheless, the results presented are quantitative and they identify those effluent constituents and types of contaminants that can be found in pulp and paper mills. However, the information presented in this report is not sufficient to derive estimates of the frequency with which the various compounds occur in mill effluents or to identify trends. This will only be possible when all Ontario mills have been sampled, as frequently as possible, under a wide range of operating conditions.

RECOMMENDATIONS

It is recommended that:

1. The effluent characterization program, described in this report, be extended to include the monitoring of all Ontario pulp and paper mills; that sampling be carried out under typical and worst case operating conditions; that the list of parameters include those used and discussed in this study; that consistent and quantitative analytical and sampling protocols be used throughout; and that the mills disclose all pertinent mill operating information necessary for interpretation of monitoring results.

2. Additional and more quantitative analytical methodologies be developed for analyses of trace contaminants of concern in pulp and paper mill effluents.

3. Further research be conducted on the environmental significance of the concentrations of hazardous trace contaminants identified in the pulp and paper mill effluents investigated and that special emphasis be placed on the fate and potential effect of these compounds on the aquatic ecosystem.

4. Government and the industry investigate available and develop new technologies to minimize or eliminate the discharge of hazardous contaminants from pulp and paper mill effluents to the aquatic environment.

5. Based on the results of this and future studies, the Ministry of Environment develop regulations for monitoring, control and compliance of the pulp and paper industry (especially with respect to hazardous contaminants), similar to the ones currently being drafted for the St. Clair River area.

TABLE 1: Description of Mills (1982)*

MILL	LOCATION	RECEIVING WATER/ BASIN/WATERSHED	PROCESSES	SALEABLE PRODUCTS	TOTAL PRODUCTION (Megagrams/day)	BOD	TSS	EFFLUENT FLOWS (1000 cubic meters/day)
Abitibi Price Fine Papers, Port Arthur Division** (APFP)	Thunder Bay	Thunder Bay/ Lake Superior	Pulping: mechanical (stone groundwood) Papermaking Coatings (clay, starch)	Fine and coated papers	275	3.2	1.5	47.9
Abitibi Price Inc., Fort William Division (APFW)	Thunder Bay	Thunder Bay/ Lake Superior	Pulping: mechanical (semichemical & stone groundwood) Papermaking	Newsprint	320	10.2	1.2	22.6
Abitibi Price Inc., Thunder Bay Division (APTB)	Thunder Bay	Thunder Bay/ Lake Superior	Pulping: sulphite, mechanical (stone groundwood) Papermaking	Newsprint	414	19.8	1.0	29.9
Boise Cascade Canada Limited (BOISE)	Fort Frances	Rainy River/Lake of-the-Woods/ Arctic	Pulping: Kraft (bleached and unbleached) mechanical (stone groundwood)	Kraft pulp Groundwood specialties	1,049	12.2	7.8	72.2
Domtar Packaging/ Kraft Paper and Board Division Red Rock Mill (DOMTAR)	Red Rock	Nipigon Bay/ Lake Superior	Pulping: Kraft (semi-bleached) mechanial (groundwood) Papermaking	Kraft linerboard Newsprint	594	7.2	4.8	91
Great Lakes Forest Products Ltd. (GLFP)	Dryden	Wabigoon River/ English River/ Arctic	Pulping: Kraft (bleached & unbleached) Papermaking	Kraft pulp Kraft specialty papers	573	14.2	5.3	113.9
Great Lakes Forest Products Ltd. (GLFPTB)	Thunder Bay	Kaministikwia R./ Lake Superior	Pulping: Kraft (bleached & semi-bleached) sulphite, mechanical (stone groundwood)	Kraft pulp Sulphite pulp Newsprint	1,964	81.9	12.3	248
James River Marathon Limited (JR) (formerly: American Can Canada Inc.)	Marathon	Lake Superior	Pulping: Kraft (bleached)	Kraft pulp	393	17.1	9.7	81.7
Kimberly-Clark of Canada Limited (KC)	Terrace Bay	Blackbird Creek/ Jackfish Bay/ Lake Superior	Pulping: Kraft (bleached)	Kraft pulp	785	32	6.58	122.6

* Information obtained from: i) "Ministry Pulp and Paper Status Report, Ontario Pulp and Paper Industry" - prepared by the Northwestern, Northeastern, West Central and Southeastern Regions and the Water Resources Branch (unpublished).
and ii) "Pulp and Paper Effluents in Ontario: The Toxicity Problem and Abatement Approaches" - C. Inniss, W.P. Suboch and O. Muller, Quality Protection Section, Water Resources Branch (unpublished).

**Name has been changed to: Provincial Papers, Division of Abitibi Price Inc.

TABLE 2: List of Parameters

Conductivity
pH
Chemical Oxygen Demand (COD)
Total Suspended Solids (TSS)
Total Dissolved Solids (TDS)
Total Solids (TS)
Biochemical Oxygen Demand (BOD_5)
Ammonia
Colour
Turbidity
Total Phosphorus (TP)
Total Kjeldahl Nitrogen (TKN)
Sodium (Na)
Chloride (Cl)
Sulphate
Dissolved Organic Carbon (DOC)
Reactive Phenolics
Tannins
Bacteria
Inorganic Trace Contaminants
Resin, Aromatic and Fatty Acids
Speciated Phenolics
Chlorophenols
Volatile Organohalides
PCB's and Organochlorine Pesticides
GC/MS
Acute Lethality (LC_{50})

TABLE 3: Summary of Inorganic Trace Contaminants in Final Mill Effluents

PARAMETER (UNITS)	N	CONCENTRATION RANGE	PWQO	N ABOVE PWQO	HIGHEST DILUTION REQUIRED TO MEET PWQO	ESTIMATED* DILUTION
Arsenic (mg/L)	18	<0.001 - 0.006	0.1	0	--	--
Cadmium (mg/L)	23	<0.0002 - 0.005	0.0002	10	1:25	a) 1:20, b) 1:9
Chromium (mg/L)	23	<0.02 - 0.21	0.1	2	1:2	--
Copper (mg/L)	23	<0.01 - 0.03	0.005	18	1:6	b) 1:9, c) 1:1000
Iron (mg/L)	21	0.33 - 4.3	0.3	21	1:14	b) 1:9
Nickel (mg/L)	18	<0.2 - 0.05	0.025	2	1:2	--
Zinc (mg/L)	23	<0.01 - 0.18	0.03	19	1:6	d) 1:7
Hydrogen Sulphide (mg/L)	24	<0.02 - 2.00	0.002	20	1:1000	b) 1:9
Cyanide (mg/L)	19	<0.001 - 0.045	0.005	1	1:9	e) 1:20

N = Number of samples
PWQO = Provincial Water Quality Objective
* = Calculated on the basis of conductivity, a conservative parameter
-- = Not available
a) = KC - at about 6km from point of discharge to Jackfish Bay
b) = APFW = at 150m from the breakwall outlet
c) = GLFPTB = at 9.5 km from point of discharge to Kaministikwia River
d) = APFP - at 600m from point of discharge to Thunder Bay Inner Harbour
e) = JR - at diffuser

TABLE 4: Summary of Resin and Fatty Acids in Final Mill Effluents

COMPOUND	N	CONCENTRATION RANGE (ug/L)	N ABOVE DETECTION	LC_{50}* (ug/L)	N ABOVE LC_{50}
Fatty Acids:					
Oleic	25	ND - 1,244	15	24,000	0
Linoleic	25	ND - 4,801	14	9,000	0
Resin Acids:					
Pimaric	25	ND - 1,795	19	800	1
Sandaracopimaric	25	ND - 3,183	19	900	2
Isopimaric	25	ND - 5,224	20	700	4
Abietic	25	ND - 15,810	22	1,100	10
Dehydroabietic	25	ND - 1,187	19	1,600	0

N = Number of samples

* = Concentration lethal to 50% of rainbow trout, (Tomlinson, 1980)

ND = Not detected

TABLE 5: Comparison of Trace Contaminant Compounds Identified in some of the Pulp and Paper Mill Effluents Examined in Ontario with Published Lists of Trace Contaminants of Concern

COMPOUNDS IDENTIFIED	(a) USEPA	(b) MOE	(c) GLWQA #1	(c) GLWQA #2	(d) P & P	(e) CPAR	(f) FOX RIVER
Abietic acid		X			X	X	X
Acetone						X	
Acetophenone							
Acetosyringone		X				X	
Acetovanillon		X				X	
Aldrin	X		X		X		X
Alicyclic hydrocarbons							
Aliphatic acids		X					
Aliphatic alcohols							
Aliphatic aldehydes							
Aliphatic amide							
Aliphatic diols							
Aliphatic ethers							
Aliphatic hydrocarbons							
Aliphatic ketones							
Aliphatic nitrile							
Alkyl benzenes							
Alkyl naphthalenes							
Aluminum							
Arachidic acid		X				X	
Arsenic	X	X			X		X
Benzaldehyde						X	
Benzaldehyde derivative							
Benzene	X	X	X		X	X	X
Benzenemethanol							
Benzenepropanoic acid							
Benzenepropanol							
Benzeneethanol							
Benzoic acid		X	X				
α-BHC	X	X		X	X		
β-BHC	X	X		X	X		
γ-BHC	X	X	X	X	X		
Bicyclo(3,3,1)nonane							

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1	GLWQA #2	P & P	CPAR	FOX RIVER
Bicyclo(3,3,1)nonanol							
Bicyclo(4,1,0)heptan-2-one							
Bicyclo(5,1,0)octane							
1,4-Bis(ethoxymethyl)cyclohexane							
Bis(2-ethylhexyl)phthalate	X	X			X		X
Borneol (+ isomer)						X	
Butanal							
Butanol*						X	
n-Butanol							
t-Butanol							
2-Butoxyethanol							
2-t-Butyl-3-cresol		X					
Cadmium	X	X		X	X		X
Camphene (+ isomers)						X	
Capric acid		X					
Camphor (+ isomer)						X	
Carbon disulphide		X	X				
Carbontetrachloride	X	X			X	X	X
Y-Chlordane	X		X		X		X
Chloro-alkyne							
(2-Chloro-2-butenyl)-benzene							
4-Chloro-2-methylpyrimidine							
4-Chloro-3-methylphenol		X					
Chlorodibromomethane	X	X			X		
Chloroform	X	X	X		X	X	X
Chromium	X	X		X			X
Cobalt							
Copper	X	X		X	X		X
o-Cresol		X	X			X	
Cyanide	X	X			X		X
Cyclohexanol derivative							
Cyclohexene carboxylic acid							
Cyclohexenol derivative							
Cyclohexenyl-ethanone							

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1	GLWQA #2	P & P	CPAR	FOX RIVER
pp-DDE	X				X		X
Decahydro-1,1,7-trimethyl-4-methylene-1H-cycloprop-(e)azulene							
Decahydro-5(hydroxy-3-methyl-3-pentenyl)-dimethyl-methylene-1-naphthalenemethanol							
Decahydro-methyl-1-methylene-propenyl-naphthalene							
2-(Decahydro-trimethyl-2-methylene-1-naphthalenyl) methyl-2,5-cyclohexadiene-1,4-dione							
Decahydrotetramethylnaphtho-(2,1-B)-furan-2(1H)-one							
Decahydrotrimethyl-4-methylene-1H-cycloprop(e)azulene							
Decahydrotrimethyl-9-methylene-1,4-methanoazulene							
Dehydroabietic acid		X			X	X	X
Di-n-butylphthalate	X	X		X	X		X
Dibenzothiophene							
Dichloroacetone							
Dichlorobromomethane	X	X			X		
Dichloroguaiacol		X				X	
Dichloromethoxybenzaldehyde							
Dichloromethoxyphenol		X					
Dichlorophenol	X1	X				X	
Dieldrin	X			X	X		X
Diethylphthalate	X	X			X	X	X
Dihydromethyl-indene							
Dihydronaphthalenes							
Dihydropentyl-furanone							
Dihydro-phenanthrylamine							
2,3-Dihydro-2-(4-hydroxy-3-methoxyphenyl)-5-3-hydroxy-1-propenyl-7-methoxy-benzofuran-methanol?		X					
Dihydro-3,4-bis-(4-hydroxy-3-methoxyphenyl) methyl-2(3H)furanone?		X					
9,10-Dihydro-3-nitro-2-phenanthrylamine							
4-(2,3-Dihydro-7-methoxy-3-methyl-5-(1-propenyl)-2-benzofuranyl)-2-methoxyphenol		X					

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1 #2	P & P	CPAR	FOX RIVER
3A/7A-Dihydro-7A-methyl-5(4H)-indanone						
N-(9-10-Dihydro-2-phenanthryl) acetamide						
3,4-Dihydroxy-3-methoxypropiophenone		X				
Dimethoxyphenol		X				
Dimethoxypropanol						
1,2-Dimethoxy-4(2-propenyl)-benzene						
Dimethoxybenzoic acid						
(2,2-Dimethoxyethyl) benzene						
Dimethoxypropyl benzenes						
6,6-Dimethyl-bicyclo(3,1,1)hept-2-ene-2-methanol						
Dimethyl disulphide					X	
1-(1,1-Dimethylethoxy)-6-methylcyclohexene						
(Dimethylethyl) formamide						
Dimethylhexadiene (+ isomers)						
Dimethylnaphthalene						
Dimethylphenol	X1	X				
Dimethylstyrene (+ isomers)						
Dimethylsulphide					X	
Dimethyltetrasulphide						
Dimethyltrisulphide						
2,7-Dimethyl-3(2H)-benzofuranone						
1-(1,4 Dimethyl-3-cyclohexenyl) ethanone						
4-(1,5-Dimethyl-3-oxohexyl)-1-cyclohexene carboxylic acid-methyl ester						
4-Dimethylaminobenzaldehyde						
Dimethylphthalate	X	X		X		
8,13-Epoxy-labd-14-ene						
Ester (from natural waxes)						
Ethanol					X	
α-Ethenyl-decahydro-tetramethyl-methylene-1-naphthalene propanol?						

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1 #2	P & P	CPAR	FOX RIVER
1-Ethenyl-1-methyl-2,4-bis-isopropenyl-cyclohexane						
α-Ethenyl-decahydro-2-hydroxy-pentamethyl-1-naphthalene-propanol (+ isomer)						
7-Ethenyl-dodecahydro-tetramethyl-phenanthrene						
5-Ethenyl-tetrahydro-2-furanmethanol						
5-Ethenyl-trimethylfuranmethanol						
3-Ethenyl-dodecahydro-pentamethyl-1H-naphtho(2,1-B) pyran						
Ethoxybenzaldehyde						
Ethylbenzene	X	X	X		X	X
Ethylbenzenediol		X				
3-Ethyl-dodecahydro-pentamethyl-naphtho-pyran-one						
3-Ethyl-dodecahydro-pentamethyl-8H-naphtho(1,2-B) pyran-8-one						
Ethyl ester?						
Ethylphenol		X				
p-Ethylresorcinol		X				
Eugenol		X			X	
Fluoranthene	X	X		X		X
Furanylethanone						
1(2-Furanyl)ethanone						
Furfural		X	X		X	
Guaiacol (+ isomers)		X			X	
Hexachlorobenzene	X	X		X		
Hexachlorocyclopentadiene	X	X		X		
Hexahydro-tetramethyl-methano-naphthalene						
Hexanal						
Hexane						
Hexanol*						
Hexathiepane						
Homovanillic acid		X			X	
Hydrogen sulphide			X			
Hydroxybenzaldehyde		X			X1	

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1 #2	P & P	CPAR	FOX RIVER
Hydroxybenzeneacetic acid		X				
Hydroxycyclohexanemethanol						
Hydroxycyclohexanone						
Hydroxymethoxybenzaldehydes		X				
Hydroxymethoxyethanone						
Hydroxyphenylbutanone		X				
1-(4-Hydroxy-3-methoxyphenyl)-2-propanone derivative						
4-Hydroxy-3-methyl-2-(2-propenyl)-2-cyclopenten-1-one						
Hydroxybenzothiazole						
Iron						
Isoborneol (+ isomer)						
Isobutanal						
Isomaltol?						
3-Isopentyl-dihydro-2,5-furandione						
Isophorone	X	X		X		X
Isopimaric acid		X		X	X	X
Isopropanol						
p-Isopropylbenzaldehyde						
4-Isopropylcyclohexanol						
2-Isopropylcyclohexanol						
2-Isopropyl-3-cresol		X				
7-Isopropylidene-bicyclo(4,1,0)heptane						
Lauric acid		X				
Lead	X	X		X		X
Levopimaric acid		X				
Limonene					X	
Linoleic acid		X		X	X	X
Linolenic acid		X		X	X	X
Manganese						
Mercury	X	X	X	X		X
Methoxypropenylphenol		X				
3-Methoxy-2-cyclopenten-1-one						
1-Methoxy-4-propenyl-benzene						
2-Methoxy-4-propyl-phenol		X				

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1 #2	P & P	CPAR	FOX RIVER
2-Methoxybenzenepropanol derivative						
2-Methoxypyridine						
Methyl acetate						
Methylbenzylalcohol						
Methylbutanal*						
Methylcyclopentanone						
Methylcyclopentenone						
Methyl-trimethylbenzoate						
Methyl-3-(phenylmethyl)benzoate						
Methyl esters*						
Methylethylbenzoic acid						
Methyl-ethyl ketone						
N-Methylformamide						
Methylfuran*					X1	
Methylindene						
Methyl-isobutyl ketone						
Methyl-isopropyl ketone						
Methylphenols		X				
Methylpyrrole*						
Methylthiophene*						
Methyl-(propenyl)-cyclohexanol						
3-Methyl-1,2-cyclopentanediol						
4-Methyl-1-isopropyl-3-cyclohexen-1-ol						
2-Methyl-1-methylene-3-propenyl-cyclopentane						
4-Methyl-1-propyl-3-cyclohexen-1-ol						
13-Methyl-13-vinyl-podocarp-7-en-3-one						
5-Methyl-2-(isopropenyl)-cyclohexanol (+ derivatives)						
6-Methyl-2-methylene-6(4-methyl-3-pentenyl)bicyclo-(3,3,1)heptane						
1-Methyl-4-(5-methyl-1-methylene-4-hexenyl)-cyclohexene						
1-Methyl-4-isopropenyl-cyclohexene						
2-Methyl-4-isopropenyl-2-cyclohexenone						
1-Methyl-4-isopropyl-cyclohexene						
1-Methyl-4-propyl-cyclohexene						

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1 #2	P & P	CPAR	FOX RIVER
2-Methyl-5-isopropenyl-2-cyclohexen-1-ol acetate						
2-Methyl-5-isopropyl-bicyclo(3,1,0)hexan-2-ol						
5-Methyl-5-phenyl-2-hexanone						
2-Methyl-5-propyl-1,3-cyclohexadiene						
2-Methyl-cyclopentane-1,3-dione						
Methyl-isopropenyl-benzene						
Methyl-isopropenyl-cyclohexanol						
Methylenechloride	X	X		X		
4-Methylene-1-isopropyl-bicyclo(3,1,0)hexan-3-ol						
4-Methylene-1-isopropyl-bicyclo(3,1,0)hexane						
Molybdenum						
Myristic acid		X			X	
Naphthalene	X	X	X	X		X
Naphthalene-methanol derivatives						
Naphthalene-one derivative						
Naphthalenepropanol derivative						
Naphthofuran-one derivative						
Neoabietic acid		X			X	
Nickel	X	X		X		X
4-Nitrophenol	X	X	X	X		X
N-Nitrosodiphenylamine	X			X		
Octahydro-methyl-2(1H)-naphthalenone						
Octahydro-hydroxy-trimethylnaphthalenone acetate						
Octahydro-tetramethyl-naphthalenemethanol						
Octahydrodimethyl-isopropylnaphthalenol						
Octahydronaphthalenone derivative						
Octahydrotetramethylmethanoazulene						
Oleic acid		X		X	X	X
Palmitic acid		X			X	X
Pentachloroacetone						
Pentachlorophenol	X	X	X	X	X	X
Pentanone*						
Pentene (+ isomer)						
Phthalic acid		X				
Phenanthrene carboxyaldehydes						

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1 #2	P & P	CPAR	FOX RIVER
Phenol (+ unidentified phenol derivatives)	X	X	X	X	X	X
Phenylbenzamine						
n-Phenylbenzamine		X				
Phenylbutanone						
Phenyl-ethanediol						
Phenylpropanol						
Phenylpropanone						
3-Phenyl-2-propenal						
4-Phenyl-3-buten-2-one						
2-(Phenylmethylene)-cyclohexanone						
Pimaric acid		X		X	X	X
α-Pinene					X	
Polychlorinated biphenyls (PCB's)	X	X	X	X		X
Polypropyleneglycol derivatives						
Propanol*					X	
n-Propanol						
Propenylphenol		X				
Propiovanillon		X				
7-Propylidene-bicyclo(4,1,0)heptane						
Resacetophenone + isomer		X				
Resin alcohol						
Resin aldehyde						
Salicylic acid		X				
Sandaracopimaric acid		X			X	
Silicone compound						
Stearic acid					X	X
Steroids		X				
Stigmastadieneone						
Stigmastadienol						
Stigmastenol						
Stigmastenone						
Styrene		X	X			
Sulphur						
Syringaldehyde		X				

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1	GLWQA #2	P & P	CPAR	FOX RIVER
Terpin hydrate							
α-Terpineol (+ isomers)						X	
Tetrachloroacetone							
Tetrachloroethylene	X	X			X		X
Tetrachloroguaiacol		X			X	X	X
2,3,4,5-Tetrachlorophenol		X				X	
2,3,5,6-Tetrachlorophenol		X				X	
Tetrahydro-hydroxy-dimethylbenzofuranone derivative							
Tetrahydro-hydroxy-dimethyl-isobenzofuranone							
Tetrahydro-isopropyl-pentamethylnaphthalene							
Tetrahydro-methyl-naphthalene							
Tetrahydrofuran							
Tetrahydrohexamethyl-s-indacene-1,7-dione							
Tetrahydrohydroxy-4(4-hydroxy-3-methoxy-phenyl) 7-methoxy-naphthofuran-1(3H)one							
Thiapentane							
Thiazolopyrimidine							
Thiophene						X	
Thiophenecarboxyaldehyde							
Toluene	X	X	X		X	X	X
Tributylphosphate							
1,1,1-Trichloroethane	X	X			X	X	X
Trichloroethylene	X	X			X		X
Trichloroguaiacol		X			X1	X	X1
2,3,4-Trichlorophenol		X	X			X	
2,4,5-Trichlorophenol		X	X			X	X
2,4,6-Trichlorophenol	X	X	X		X	X	X
Trimethoxybenzene							
(1,2,2-Trimethoxyethyl)-benzene							
1,3,3-Trimethyl-bicyclo(2,2,1)heptan-2-ol							
3,7,7-Trimethyl-bicyclo(4,1,0)heptane							
1,3,3-Trimethyl-bicyclo(3,1,1)heptan-2-one							
1,7,7-Trimethyl-bicyclo(2,2,1)heptan-2-one?							
2,6,6-Trimethyl-bicyclo(3,1,1)heptan-3-one							

TABLE 5: Cont'd

COMPOUNDS IDENTIFIED	USEPA	MOE	GLWQA #1 #2	P & P	CPAR	FOX RIVER
3,7,7-Trimethyl-bicyclo(4,1,0)hept-2-ene						
Trimethylcyclopentanone						
Trimethylcyclopentenone		X				
Trimethylphenol						
Trimethylquinolines						
1,3,3-Trimethyl-2-oxabicyclo(2,2,2)octane						
4,11,11-Trimethyl-8-methylene-bicyclo(7,2,0)undec-4-ene						
Triterpanes						
1,2,4-Trithiolane		X			X	
Vanillic acid		X				
Vanillin						
Veratrole		X	X	X		X
m-Xylene		X	X	X		X
o- or p-Xylene	X	X		X		X
Zinc						

a) - United States Environmental Protection Agency (USEPA); (Keith and Telliard 1979).
b) - Ontario Ministry of the Environment (MOE); (MOE 1982).
c) - Great Lakes Water Quality Agreement (GLWQA); (IJC 1978).
d) - (USEPA 1981).
e) - Committee on Pollution Abatement Research (CPAR) - List of compounds compiled specifically for this program, which were identified in pulp and paper mill process streams and published in a number of CPAR Project Reports.
f) - (Sullivan and Delfino 1982).
BHC - Hexachlorocyclohexane
* - Isomer unknown
? - Tentative identification
1 - Isomer specified

Table 6: Compounds Detected in Some of the Pulp and Paper Mill Effluents Examined in Ontario which were Identified by Chemical Formula Only

C6 H12	
C6 H14	
C7 H4 O2 C14	(Phenol derivative)
C7 H10 O2	
C7 H16	
C8 H8 O3	
C8 H18	
C9 H8 O	
C9 H8 O2	
C9 H10 O4	
C9 H12	
C9 H14	
C10 H12 O2	(Phenol derivative)
C10 H12 O3	
C10 H14	
C10 H14 O	
C10 H14 O2	
C10 H14 O2	(Phenol derivative)
C10 H16	
C10 H16 O	
C10 H18	
C10 H18 O	
C10 H20 O	
C10 H22 O3	
C10 H26 O	
C11 H14 O2	
C11 H16	(Tetrahydronaphthalenes)
C12 H16	
C12 H16	(Tetrahydronaphthalenes)
C13 H18	(Tetrahydronaphthalenes)
C15 H24	
C15 H24	(Naphthalene derivatives)
C15 H26 O	
C18 H22	
C20 H22 O6	
C20 H28 O	
C20 H28 O	(Phenanthrene carboxaldehyde)
C20 H30 O	
C20 H30 O2	
C20 H32	
C20 H34 O	(Naphthalene derivative)
C20 H34 O2	
C21 H30 O2	(Phenanthrene derivative)
C21 H32 O2	(Cyclohexane carboxylic acid derivative)
C22 H42 O4	(Hexanedioic acid esters)

TABLE 7: Classification and Possible Sources of Trace Contaminants Found in Some of the Pulp and Paper Mill Effluents Examined in Ontario

1. Terpenes & Associated Compounds

- Bicyclo(3,3,1)nonane
- Bicyclo(3,3,1)nonanol
- Bicyclo(4,1,0)heptan-2-one
- Bicyclo(5,1,0)octane
- 1,4-Bis(ethoxymethyl)cyclohexane
- Borneol (+ isomer)
- Camphene (+ isomers)
- Camphor (+ isomer)
- Cyclohexanol derivative
- Cyclohexene carboxylic acid
- Cyclohexenol derivative
- Cyclohexenyl-ethanone
- Decahydro-1,1,7-trimethyl-4-methylene-1H-cycloprop-(e)azulene
- Decahydro-5(hydroxy-3-methyl-3-pentenyl)-dimethyl-methylene-1-naphthalenemethanol
- Decahydro-methyl-1-methylene-propenyl-naphthalene
- 2-(Decahydro-trimethyl-2-methylene-1-naphthalenyl)methyl-2,5-cyclohexadiene-1,4-dione
- Decahydrotetramethylnaphtho-(2,1-B)-furan-2(1H)-one
- Decahydrotrimethyl-4-methylene-1H-cycloprop(e)azulene
- Decahydrotrimethyl-9-methylene-1,4-methanoazulene
- 6,6-Dimethyl-bicyclo(3,1,1)hept-2-ene-2-methanol
- 1-(1,1-Dimethylethoxy)-6-methylcyclohexene
- 1-(1,4 Dimethyl-3-cyclohexenyl) ethanone
- 4-(1,5-Dimethyl-3-oxohexyl)-1-cyclohexene carboxylic acid-methyl ester
- 8,13-Epoxy-labd-14-ene
- α-Ethenyl-decahydro-2-hydroxy-pentamethyl-1-naphthalene-propanol (+ isomer)
- α-Ethenyl-decahydro-tetramethyl-methylene-1-naphthalene propanol?
- 7-Ethenyl-dodecahydro-tetramethyl-phenanthrene
- 1-Ethenyl-1-methyl-2,4-bis-isopropenyl-cyclohexane
- 3-Ethenyl-dodecahydro-pentamethyl-1H-naphtho(2,1-B)pyran
- 5-Ethenyl-trimethylfuranmethanol
- 3-Ethyl-dodecahydro-pentamethyl-naphtho-pyran-one
- 3-Ethyl-dodecahydro-pentamethyl-8H-naphtho(1,2-B)pyran-8-one
- Hexahydro-tetramethyl-methano-naphthalene

Table 7: (Cont'd)

1. Terpenes & Associated Compounds (cont'd)

Hydroxycyclohexanemethanol
Hydroxycyclohexanone
4-Hydroxy-3-methyl-2-(2-propenyl)-2-cyclopenten-1-one
Isoborneol (+ isomer)
4-Isopropylcyclohexanol
2-Isopropylcyclohexanol
7-Isopropylidene-bicyclo(4,1,0)heptane
Limonene
3-Methoxy-2-cyclopenten-1-one
1-Methoxy-4-propenyl-benzene
Methylcyclopentanone
Methylcyclopentenone
Methyl-(propenyl)-cyclohexanol
4-Methyl-1-isopropyl-3-cyclohexen-1-ol
2-Methyl-1-methylene-3-propenyl-cyclopentane
4-Methyl-1-propyl-3-cyclohexen-1-ol
13 -Methyl-13-vinyl-podocarp-7-en-3-one
5-Methyl-2-(isopropenyl)-cyclohexanol (+ derivatives)
6-Methyl-2-methylene-6(4-methyl-3-pentenyl)bicyclo-(3,3,1)heptane
1-Methyl-4-(5-methyl-1-methylene-4-hexenyl)-cyclohexene
1-Methyl-4-isopropenyl-cyclohexene
2-Methyl-4-isopropenyl-2-cyclohexenone
1-Methyl-4-isopropyl-cyclohexene
1-Methyl-4-propyl-cyclohexene
2-Methyl-5-isopropenyl-2-cyclohexen-1-ol acetate
2-Methyl-5-isopropyl-bicyclo(3,1,0)hexan-2-ol
2-Methyl-5-propyl-1,3-cyclohexadiene
2-Methyl-cyclopentane-1,3-dione
Methyl-isopropenyl-benzene
Methyl-isopropenyl-cyclohexanol
4-Methylene-1-isopropyl-bicyclo(3,1,0)hexan-3-ol
4-Methylene-1-isopropyl-bicyclo(3,1,0)hexane
Naphthalene-methanol derivatives
Naphthalene-one derivative
Naphthalenepropanol derivative
Naphthofuran-one derivative
Octahydro-methyl-2(1H)-naphthalenone
Octahydro-hydroxy-trimethylnaphthalenone acetate

Table 7: (Cont'd)

1. Terpenes & Associated Compounds (Cont'd)
   - Octahydro-tetramethyl-naphthalenemethanol
   - Octahydrodimethyl-isopropylnaphthalenol
   - Octahydronaphthalenone derivative
   - Octahydrotetramethylmethanoazulene
   - α-Pinene
   - 7-Propylidene-bicyclo(4,1,0)heptane
   - Terpin hydrate
   - α-Terpineol (+ isomers)
   - Tetrahydro-isopropyl-pentamethylnaphthalene
   - 1,3,3-Trimethyl-bicyclo(2,2,1)heptan-2-ol
   - 3,7,7-Trimethyl-bicyclo(4,1,0)heptane
   - 1,3,3-Trimethyl-bicyclo(3,1,1)heptan-2-one
   - 1,7,7-Trimethyl-bicyclo(2,2,1)heptan-2-one?
   - 2,6,6-Trimethyl-bicyclo(3,1,1)heptan-3-one
   - 3,7,7-Trimethyl-bicyclo(4,1,0)hept-2-ene
   - Trimethylcyclopentanone
   - Trimethylcyclopentenone
   - 1,3,3-Trimethyl-2-oxabicyclo(2,2,2)octane
   - 4,11,11-Trimethyl-8-methylene-bicyclo(7,2,0)undec-4-ene
   - Triterpanes

2. Products of Chlorination
   - (2-Chloro-2-butenyl)-benzene
   - 4-Chloro-2-methylpyrimidine
   - 4-Chloro-3-methylphenol
   - Chloro-alkyne
   - Chlorodibromomethane
   - Chloroform
   - Dichloroacetone
   - Dichlorobromomethane
   - Dichloroguaiacol
   - Dichloromethoxybenzaldehyde
   - Dichloromethoxyphenol
   - Dichlorophenol
   - Hexachlorobenzene
   - Hexachlorocyclopentadiene
   - Pentachloroacetone
   - Pentachlorophenol

2. Products of Chlorination (Cont'd)
   - Tetrachloroacetone
   - Tetrachloroguaiacol
   - 2,3,4,5-Tetrachlorophenol
   - 2,3,5,6-Tetrachlorophenol
   - Trichloroguaiacol
   - 2,3,4-Trichlorophenol
   - 2,4,5-Trichlorophenol
   - 2,4,6-Trichlorophenol

3. Industrial Solvents and Additives
   - Acetone
   - Benzene
   - Bis(2-ethylhexyl)phthalate
   - Butanal
   - Butanol*
   - n-Butanol
   - t-Butanol
   - 2-Butoxyethanol
   - Carbontebrachloride
   - Chloroform
   - Di-n-butylphthalate
   - Diethylphthalate
   - (Dimethylethyl) formamide
   - Ethanol
   - Ethylbenzene
   - Isophorone
   - Isopropanol
   - Methyl acetate
   - Methyl-ethyl ketone
   - N-Methylformamide
   - Methyl-isobutyl ketone
   - Methyl-isopropyl ketone
   - Methylenechloride
   - 4-Nitrophenol
   - N-Nitrosodiphenylamine
   - Phenylbenzamine
   - n-Phenylbenzamine

Table 7: (Cont'd)

3. Industrial Solvents and Additives (Cont'd)
   - Polypropyleneglycol derivatives
   - Propanol*
   - n-Propanol
   - Silicone compound
   - Tetrachloroethylene
   - Tetrahydrofuran
   - Toluene
   - Tributylphosphate
   - 1,1,1-Trichloroethane
   - Trichloroethylene
   - m-Xylene
   - o- or p-Xylene

4. Lignin Degradation Products and Natural Products
   - Acetophenone
   - Acetosyringone
   - Acetovanillon
   - Alkyl benzenes
   - Benzaldehyde
   - Benzaldehyde derivative
   - Benzenemethanol
   - Benzenepropanoic acid
   - Benzenepropanol
   - Benzeneethanol
   - Benzoic acid
   - 2-t-Butyl-3-cresol
   - o-Cresol
   - Dihydropentyl-furanone
   - 2,3-Dihydro-2-(4-hydroxy-3-methoxyphenyl)-5-3-hydroxy-1-propenyl-7-methoxy-benzofuran-methanol?
   - Dihydro-3,4-bis-(4-hydroxy-3-methoxyphenyl) methyl-2(3H)furanone?
   - 4-(2,3-Dihydro-7-methoxy-3-methyl-5-(1-propenyl)-2-benzofuranyl)-2-methoxyphenol
   - 3,4-Dihydroxy-3-methoxypropiophenone
   - Dimethoxyphenol
   - Dimethoxypropanol
   - 1,2-Dimethoxy-4(2-propenyl)-benzene
   - Dimethoxybenzoic acid

Table 7: (Cont'd)

4. Lignin Degradation Products and Natural Products (Cont'd)

(2,2-Dimethoxyethyl) benzene
Dimethoxypropyl benzenes
Dimethylphenol
2,7-Dimethyl-3(2H)-benzofuranone
5-Ethenyl-tetrahydro-2-furanmethanol
Ethoxybenzaldehyde
Ethylbenzenediol
Ethylphenol
p-Ethylresorcinol
Eugenol
Furanylethanone
1(2-Furanyl)ethanone
Furfural
Guaiacol (+ isomers)
Hexanal
Homovanillic acid
Hydroxygenzaldehyde
Hydroxybenzeneacetic acid
Hydroxymethoxybenzaldehydes
Hydroxymethoxyethanone
Hydroxyphenylbutanone
1-(4-Hydroxy-3-methoxyphenyl)-2-propanone derivative
Isobutanal
Isomaltol?
3-Isopentyl-dihydro-2,5-furandione
p-Isopropylbenzaldehyde
2-Isopropyl-3-cresol
Methoxypropenylphenol
2-Methoxy-4-propyl-phenol
2-Methoxybenzenepropanol derivative
Methylbenzylalcohol
Methylbutanal*
Methyl-trimethylbenzoate
Methyl-3-(phenylmethyl)benzoate
Methylethylbenzoic acid
Methylfuran*
Methylphenols
3-Methyl-1,2-cyclopenthanediol
5-Methyl-5-phenyl-2-hexanone
Pentanone*
Phthalic acid
Phenol (+ unidentified phenol derivatives)
Phenylbutanone
Phenyl-ethanendiol
Phenylpropanol
Phenylpropanone
3-Phenyl-2- propenal
4-Phenyl-3-buten-2-one
2-(Phenylmethylene)-cyclohexanone
Propenylphenol
Propiovanillon
Resacetophenone + isomer
Salicylic acid
Steroids
Stigmastadieneone
Stigmastadienol
Stigmastenol
Stigmastenone
Syringaldehyde
Tetrahydro-hydroxy-dimethylbenzofuranone derivative
Tetrahydro-hydroxy-dimethyl-isobenzofuranone
Tetrahydrohydroxy-4(4-hydroxy-3-methoxy-phenyl)7-methoxy-naphthofuran-1(3H)one
Trimethoxybenzene
(1,2,2-Trimethoxyethyl)-benzene
Trimethylphenol
Trimethylquinolines
Vanillic acid
Vanillin
Veratrole

Table 7: (Cont'd)

5. Resin Acids and Associated Compounds
   - Abietic acid
   - Dehydroabietic acid
   - Isopimaric acid
   - Levopimaric acid
   - Neoabietic acid
   - Pimaric acid
   - Resin alcohol
   - Resin aldehyde
   - Sandaracopimaric acid

6. Fatty Acids
   - Aliphatic acids
   - Arachidic acid
   - Capric acid
   - Lauric acid
   - Linoleic acid
   - Linolenic acid
   - Myristic acid
   - Oleic acid
   - Palmitic acid
   - Stearic acid

7. Fatty Alcohols
   - Aliphatic alcohols
   - Aliphatic diols
   - Hexanol*

8. Hydrocarbons
   - Alicyclic hydrocarbons
   - Aliphatic hydrocarbons
   - Dimethylhexadiene (+ isomers)
   - Hexane
   - Pentene (+ isomer)

9. Pesticides
   - Aldrin
   - α-BHC
   - β-BHC
   - γ-BHC
   - γ-Chlordane
   - pp-DDE
   - Dieldrin
   - Hexachlorobenzene
   - Pentachlorophenol

10. Metals and Inorganics
   - Aluminum
   - Arsenic
   - Cadmium
   - Chromium
   - Cobalt
   - Copper
   - Cyanide
   - Iron
   - Lead
   - Manganese
   - Mercury
   - Molybdenum
   - Nickel
   - Zinc

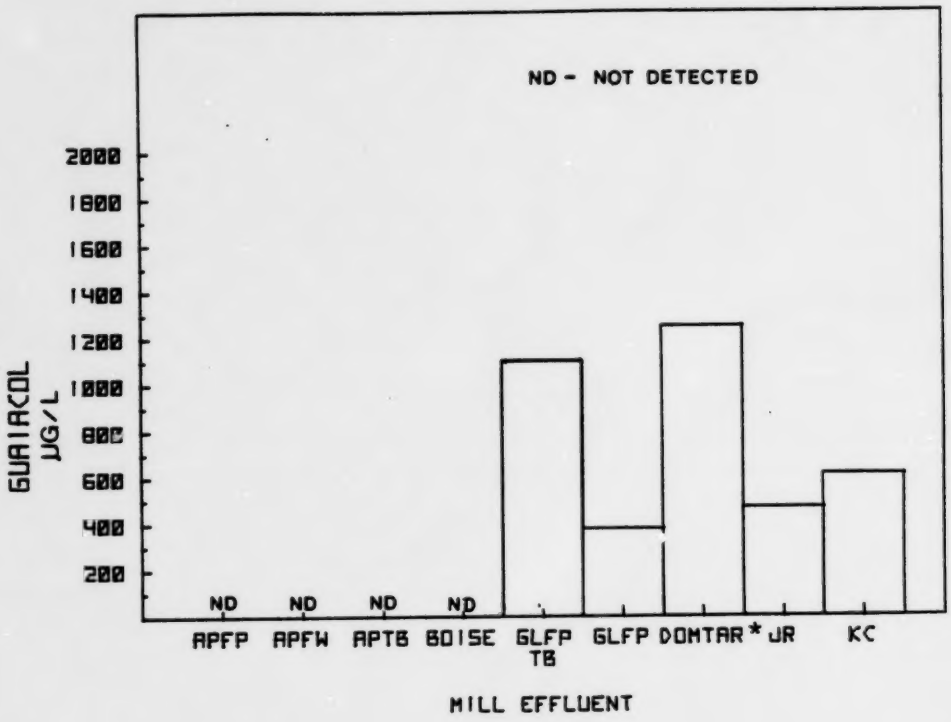
11. Products of Sulphite Process and Sulphur Cycle Intermediates
   - Carbon disulphide
   - Dimethyl disulphide
   - Dimethylsulphide
   - Dimethyltetrasulphide
   - Dimethyltrisulphide
   - Hexathiepane
   - Hydrogen sulphide
   - Sulphur
   - Thiapentane
   - 1,2,4-Trithiolane

Table 7: (Cont'd)

12. Miscellaneous Organic Compounds

- Aliphatic aldehydes
- Aliphatic amide
- Aliphatic ethers
- Aliphatic ketones
- Aliphatic nitrile
- Alkyl naphthalenes
- Dibenzothiophene
- Dihydromethyl-indene
- Dihydronaphthalenes
- Dihydro-phenanthrylamine
- 9,10-Dihydro-3-nitro-2-phenanthrylamine
- 3A/7A-Dihydro-7A-methyl-5(4H)-indanone
- N-(9-10-Dihydro-2-phenanthryl) acetamide
- Dimethylnaphthalene
- Dimethylstyrene (+ isomers)
- 4-Dimethylaminobenzaldehyde
- Dimethylphthalate
- Ester (from natural waxes)
- Ethyl ester?
- Fluoranthene
- Hydroxybenzothiazole
- 2-Methoxypyridine
- Methyl esters*
- Methylindene
- Methylpyrrole*
- Methylthiophene*
- Naphthalene
- Pnenanthrene carboxyaldehydes
- Polychlorinated biphenyls (PCB's)
- Styrene
- Tetrahydro-methyl-naphthalene
- Tetrahydrohexamethyl-s-indacene-1,7-dione
- Thiazolopyrimidine
- Thiophene
- Thiophenecarboxyaldehyde

* - Isomer unknown
? - Tentative identification of compound
BHC - Hexachlorocyclohexane



* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

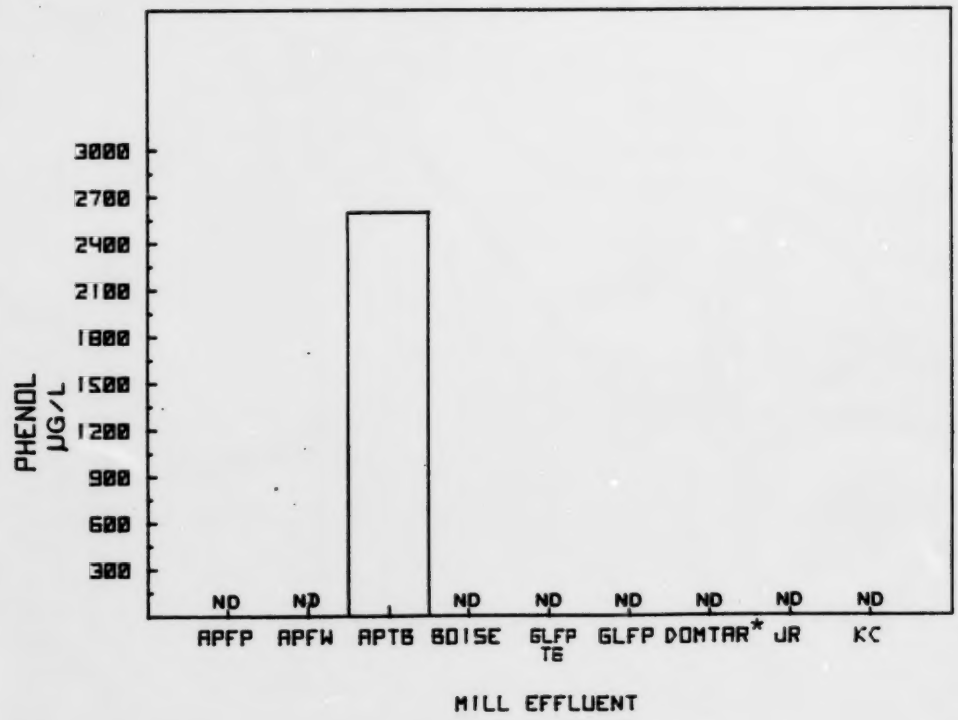


Figure 1 – Concentration of Guaiacol & Phenol in Final Mill Effluents

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

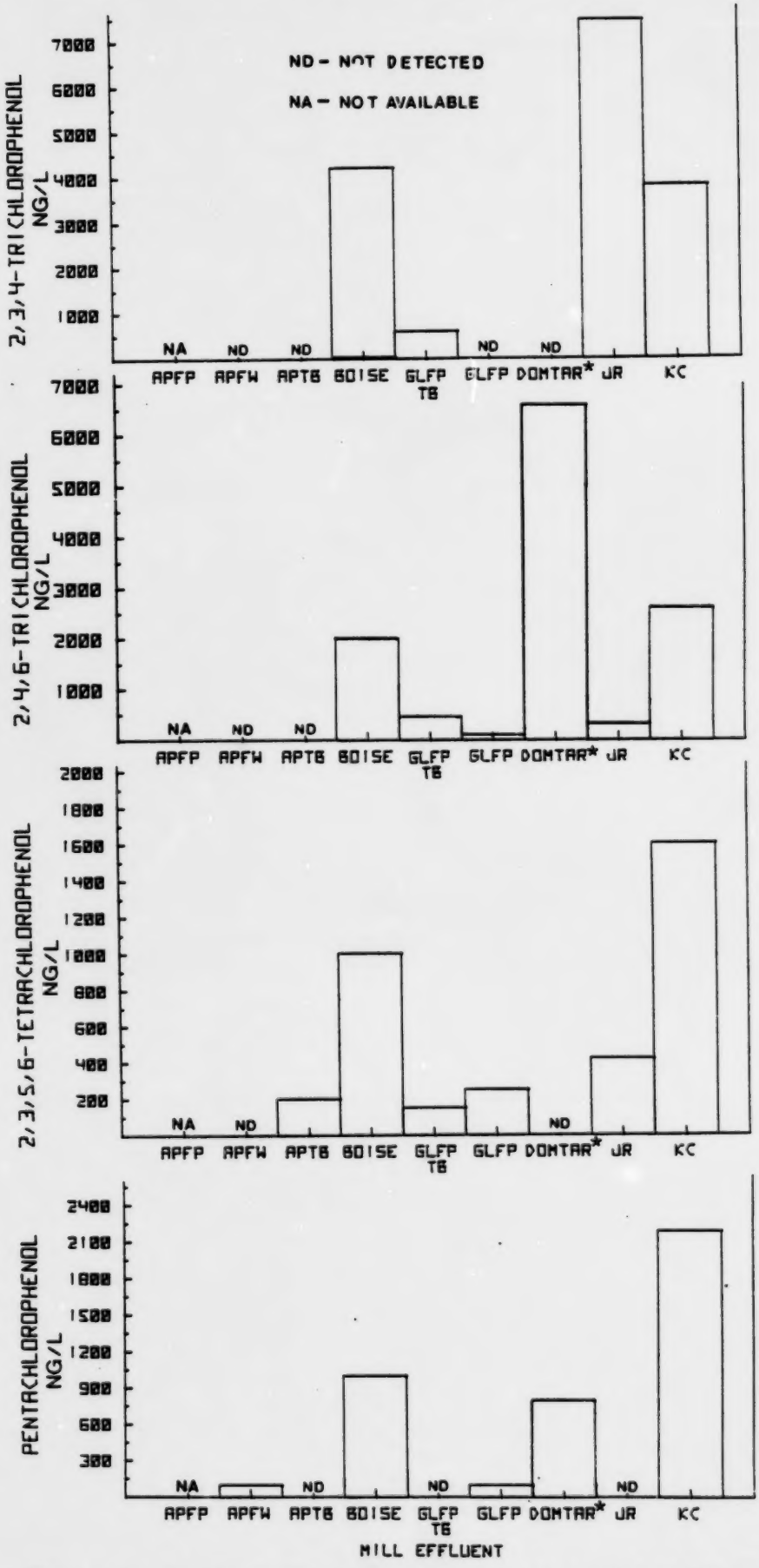


Figure 2 – Concentration of Chlorophenols in Final Mill Effluents

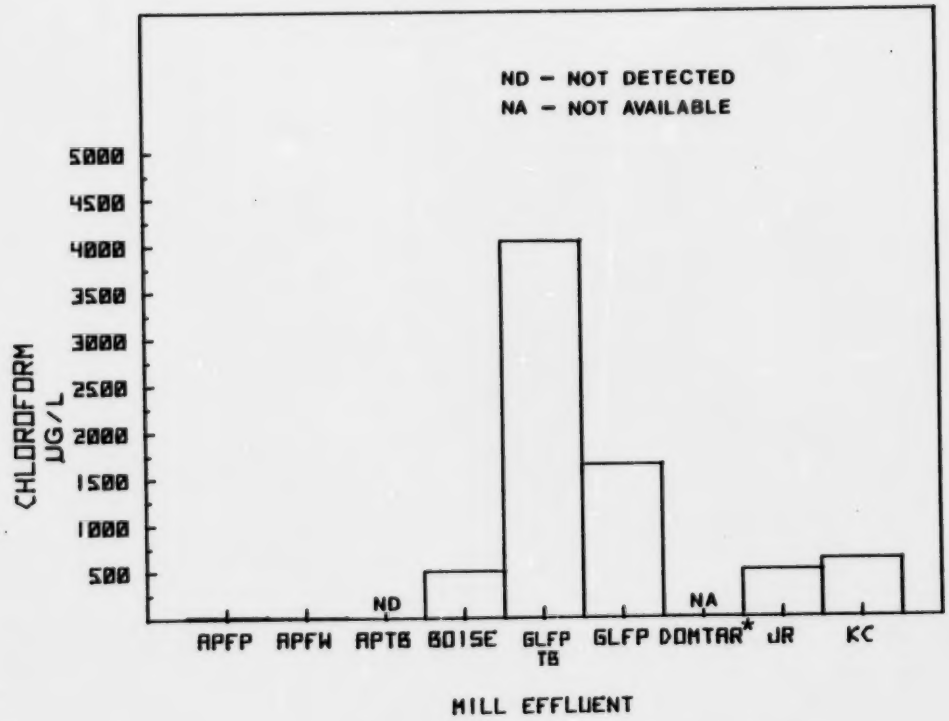


Figure 3 – Concentration of Chloroform in Final Mill Effluents

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

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APPENDIX A

APPENDIX A

SAMPLE COLLECTION

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SAMPLE COLLECTION

At the start of the program both grab and composite samples were collected. Effluent was collected in plastic buckets for samples designated for metal analyses and stainless steel or glass containers were used for the remainder of the samples. Effluents were then transferred to individual sample bottles and treated with preservative as required. Composite samples were collected by an Isco sampler in plastic-lined 45 gallon drums.

During the course of the program in order to reduce contamination, minimize sample variability and facilitate sampling, the collection of composite samples was discontinued. Only grab samples were collected, in designated sample bottles, by dipping the sample bottle directly into the effluent stream using a "glug-glug" or bacteriological sampling pole. The samples were collected and treated as described below.

1. Discrete* Samples for the Toronto Lab

   i) Fill one, 1 L bottle and add 3 NaOH pellets; label "Cyanide" (CN).

   ii) Fill one 1 L glass bottle; adjust pH to 10-11 with 5% sodium bicarbonate or one NaOH pellet; check pH with pH sticks, then add 2N zinc acetate (approximately 2 mL are needed) drop by drop, until a white precipitate forms; label "Sulphides".

   iii) Fill up to the label only, one 150 mL sodium thiosulphate treated, glass Bacti bottle; label "Sulphate Reducers"; store at 4°C and ship to the Lab on the same day.

   iv) Fill to the top a 150 mL glass bottle (with foil-lined cap); label "Volatile Organohalides".

   v) Fill to the top a 1 L solvent-rinsed glass, PCB bottle (with foil-lined cap); label "GC/MS - Grab Sample" and ship refrigerated (4°C).

*Note: These samples are to be collected only once per day during the last sampling session.

2. Composite Samples for the Toronto Lab

Use a composite "Isco" sampler or composite samples directly in designated sample bottles by adding specified volumes of effluent to each bottle, at intervals, over a period of time, until the whole bottle is filled. Label the bottle as a "composite" sample and maintain at $4^{o}C$ storage throughout the whole sampling process.

i) Fill to the top two, 1 L solvent-rinsed glass, PCB bottles (with foil-lined caps); label "GC/MS - Composite sample" and ship at $4^{o}C$.

* ii) Fill up to the line only, a 1 L solvent-rinsed glass, PCB bottle (with foil-lined cap); label "PCB-OC Scan".

* iii) Fill up to the line only, a 1 L solvent-rinsed, PCB bottle (with teflon-lined cap); add approximately 2 mL of phosphoric acid/1 L of sample to bring pH to 2.0; label the bottle "Chlorophenol Scan".

*NOTE: Collect two, 1 L bottles of control water (i.e. raw water from intake pipe at the mill) per batch of samples submitted for PCB-OC and chlorophenol scans. Sampling requirements are the same as described in ii) and iii).

iv) Fill up to the label only, two, 1 L glass bottles (with teflon or foil caps); adjust to pH 2 with phosphoric acid (approximately 2 mL/1 L); label one bottle "Phenolics Speciated", and the other "Resin, Aromatic and Fatty Acids Scan".

v) Fill up to the label, a 150 mL glass bottle (with foil-lined cap); label "Tannins".

vi) Fill one, 150 mL plain, glass Bacti bottle (with a polyseal or foil cap); label "Dissolved Organic Carbon" and "Sulphate".

vii) Fill up to the label only, one, 150 ml preservative-rinsed, glass, special "phenolics" bottle (with new cap); shake well; label "Total Phenolics" store upright at $4^{o}C$ and ship same day.

3. Composite Samples for the Thunder Bay Lab

i) Fill a 1 L glass bottle marked "Total Suspended Solids (TSS) and Total Dissolved Solids (TDS)".

ii) Fill a 1 L glass bottle marked "Chemical Oxygen Demand (COD)", "Conductivity", "Colour Apparent", "Turbidity" and "BOD_5", "Total Phosphorus (TP)", "Total Kjeldahl Nitrogen (TKN)", "Chloride", "Sodium (Na)" and "pH".

iii) Fill a 150 mL glass bottle (with polyseal cap) marked "Total Mercury"; preserve with nitric acid and potassium dichromate or potassium permanganate.

iv) Fill a 500 mL acid-washed plastic Nalgene bottle (with plastic cap) and preserve with 20 drops of concentrated nitric acid; label "Metals + As".

4. Discrete Samples for the Thunder Bay Lab

i) Fill up to the line only, two, 150 mL sodium thiosulphate treated Bacti bottles; label one bottle "Total and Fecal Coliforms" and the other "Heterotrophs and Pseudomonas".

ii) Fill a 150 mL glass bottle marked "Ammonia (NH_3)"; and store at $4^{o}C$.

5. Discrete Samples for the Mobile Toxicity Lab, Thunder Bay

Collect 15 to 25 gallons of effluent for fish toxicity testing in 5 gallon pails lined with food-grade resin polyethylene bags.

PLEASE NOTE:

It is important that samples requiring refrigeration be shipped in coolers containing ice packs or ice cubes stored in plastic bags. Samples designated for the Toronto lab should be shipped out by air on the same day as collected. Request airlines to refrigerate samples on arrival in Toronto and to deliver them to the MOE lab as soon as possible.

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APPENDIX B

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TABLE:1 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS.

PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION

DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANNINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	(1) LC50
JULY 7,1982:																			
GROUNDWOOD EFFLUENT	17.0	5	6.4	1.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100
PAPER MILL EFFLUENT	78.0	5	191.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NL
AUGUST 4,1982:																			
FINAL EFFLUENT	18.2	4	20.5	<1.0	55	280	25	255	80	39	315	33	0.09	1.6	6.8	13	7.8	0.02	--
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

-- -NOT AVAILABLE
HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
NL -NON LETHAL
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.
< -LESS THAN

TABLE:2 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF ABITIBI PRICE INC., FORT WILLIAM DIVISION, EFFLUENTS.

	PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION																		
DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	LC50 (1)
JULY 21,1982:																			
COMBINED FINAL EFFLUENT*	300	250	183	300	360	1420	70	1350	1490	600	880	100	0.50	2.6	36	200	5.7	0.06	75
FINAL EFFLUENT**	284	200	162	212	290	1290	25	1265	960	397	875	100	1.30	5.3	31	200	6.0	0.04	NL
WOODROOM EFFLUENT	505	400	222	600	580	1760	130	1630	2204	1264	890	130	1.40	5.8	35	190	5.3	0.16	14
SCMP EFFLUENT	644	400	313	660	670	2980	245	2735	2910	707	1690	220	0.40	3.3	36	400	5.7	0.10	17
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

-- -NOT AVAILABLE
* -NO.1 & NO.2 LAGOON EFFLUENTS AND WOODROOM EFFLUENT
** -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP -SEMI CHEMICAL MECHANICAL PULPING
HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
NL -NON LETHAL
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.

TABLE:8 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF ABITIBI PRICE INC., THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION

DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	LC50 (1)
JUNE 3,1982:																			
FINAL EFFLUENT	6.5	300	--	260	540	2070	45	2025	2600	202	1095	--	.430	--	--	--	4.5	.05	15
JUNE 16,1982:																			
FINAL EFFLUENT	80	350	199	660	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14
JULY 21,1982:																			
FINAL EFFLUENT																			
SAMPLE #1	260	300	187	320	490	1790	35	1755	1940	245	625	61.00	.340	1.90	18	130	5.7	.02	34
SAMPLE #2	--	--	--	--	500	1780	40	1740	1960	232	635	65.00	--	--	17	130	5.6	--	--
SAMPLE #3	--	--	--	--	500	1760	50	1710	1900	231	630	64.00	--	--	17	130	5.5	--	--
SAMPLE #4	--	--	--	--	470	1760	50	1710	1730	180	635	66.00	--	--	16	130	5.3	--	--
MILL INTAKE WATER																			
SAMPLE #1	5.7	1.0	5.1	2.2	0.5	45	2	43	<10	6	107	.70	.006	.18	2.1	1.9	7.9	<.01	--
SAMPLE #2	--	--	--	--	0.1	90	2	88	<10	8	105	.60	--	--	2.1	1.8	8.0	--	--
SAMPLE #3	--	--	--	--	0.2	80	2	78	<10	5	105	.60	--	--	2.1	1.9	8.0	--	--
SAMPLE #4	--	--	--	--	0.1	50	1	49	<10	9	106	.55	--	--	2.1	1.9	8.0	--	--
JULY 22,1982:																			
FINAL EFFLUENT																			
SAMPLE #1	600	200	191	160	460	1570	50	1520	1630	197	620	60.00	.310	1.60	16	120	4.7	.02	36
SAMPLE #2	--	--	--	--	440	1620	40	1580	1630	193	620	59.00	--	--	17	130	4.7	--	--
SAMPLE #3	--	--	--	--	510	1760	40	1720	1960	197	645	58.00	--	--	18	140	4.6	--	--
SAMPLE #4	--	--	--	--	490	1760	40	1720	1940	198	660	60.00	--	--	19	140	4.5	--	--
MILL INTAKE WATER																			
SAMPLE #1	--	--	--	--	1.4	80	4	76	<10	6	107	50.00	.007	.35	--	--	7.6	<.01	--
SAMPLE #2	--	--	--	--	1.1	52	1	51	<10	6	107	.50	--	--	--	--	7.7	--	--
SAMPLE #3	--	--	--	--	1.2	60	1	59	<10	8	108	.55	--	--	--	--	7.6	--	--
SAMPLE #4	--	--	--	--	1.3	75	1	74	<10	7	108	.50	--	--	--	--	7.6	--	--
JULY 23,1982:																			
FINAL EFFLUENT																			
SAMPLE #1	380	200	238	205	430	1370	30	1340	1740	212	575	53.00	.340	1.60	15	110	5.0	.02	37
SAMPLE #2	--	--	--	--	400	1590	35	1555	1640	207	575	54.00	--	--	--	--	4.8	--	--
SAMPLE #3	--	--	--	--	400	1590	35	1555	1660	208	580	54.00	--	--	--	--	4.7	--	--
SAMPLE #4	--	--	--	--	490	2055	25	2030	2800	210	710	57.00	--	--	--	--	4.4	--	--
MILL INTAKE WATER																			
SAMPLE #1	--	--	--	--	1.1	70	1	69	35	7	106	.60	.004	.17	--	--	7.9	<.01	--
SAMPLE #2	--	--	--	--	0.9	50	1	49	25	6	106	.45	--	--	--	--	7.5	--	--
SAMPLE #3	--	--	--	--	1.0	70	1	69	20	7	105	.45	--	--	--	--	7.6	--	--
SAMPLE #4	--	--	--	--	0.9	90	1	89	20	9	104	.45	--	--	--	--	7.7	--	--
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

-- -NOT AVAILABLE
HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS

BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.
< -LESS THAN

TABLE:4 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF BOISE CASCADE CANADA LIMITED, FORT FRANCES, EFFLUENTS.

PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION																				
DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	LC50 (1)
JULY 13,1982:																			(2)
FINAL EFFLUENT	180	150	128	380	120	1630	100	1530	850	2075	1930	8.6	1.3	4.3	445	340	6.6	0.06	81
SECONDARY LAGOON INFLUENT	230	200	76	1500	310	1690	65	1625	1040	2117	1860	2.7	1.6	4.5	197	380	10.4	0.50	57
SECONDARY LAGOON EFFLUENT	245	200	168	660	80	2640	75	2565	1010	3980	3520	0.9	1.9	7.0	905	660	6.9	0.14	>80
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
> -GREATER THAN
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.
(2) -SPLIT SAMPLE

TABLE:5 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF DOMTAR PACKAGING/KRAFT PAPER AND BOARD DIVISION RED ROCK MILL, EFFLUENTS AND MILL INTAKE WATER.

PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION

DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANNINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	(1) LC50
JUNE 14,1982:																			
FINAL EFFLUENT*	--	50	--	1520	100	580	80	500	480	400	625	27	0.30	2.1	32.0	115	7.0	0.34	--
JULY 5,1982:																			
WOODROOM EFFLUENT																			
ALUM UNTREATED	680	400	66.6	1800	1000	5000	1690	3210	3780	2722	1523	35	3.70	16.0	15.0	17	3.7	0.08	3.3
ALUM TREATED	540	500	1140	600	1200	3650	2220	1430	5480	2824	294	36	3.40	17.0	14.0	17	5.4	0.12	3.9
JULY 17,1983:																			
FINAL EFFLUENT*	55	50	154	3350	130	780	65	715	460	434	745	51	0.36	2.0	89.0	120	7.0	0.82	84.
MILL INTAKE WATER	4	0	2.7	<0.4	0.4	120	3	117	3	13	131	2	0.01	0.3	1.4	2	7.8	0.34	NL
JULY 18,1983:																			
FINAL EFFLUENT*	86	50	141	2980	110	630	80	550	429	289	620	55	0.29	2.0	58.0	100	6.8	0.25	80(2) >100(3)
MILL INTAKE WATER	4	0	3.0	<0.2	0.7	100	1	99	8	15	124	3	0.01	0.2	1.3	2	7.9	0.01	NL
JULY 19,1983:																			
FINAL EFFLUENT*	41	50	116	3020	106	470	70	400	349	227	424	49	0.25	1.9	16.0	70	6.8	0.33	>100
MILL INTAKE WATER	3	0	3.1	<0.4	0.7	85	3	82	14	11	117	3	0.01	0.2	1.3	1	7.7	0.01	NL
JULY 20,1983:																			
FINAL EFFLUENT*	57	60	114	2360	120	530	90	440	413	347	454	48	0.25	1.6	18.0	80	7.1	0.15	78
MILL INTAKE WATER	4	1	3.1	0.8	0.9	110	6	104	6	15	119	2	0.01	0.2	1.3	2	7.7	0.01	NL
JULY 21,1983:																			
FINAL EFFLUENT*	75	60	140	3040	128	680	70	610	420	389	665	48	0.41	2.2	71.0	110	7.0	0.03	90
MILL INTAKE WATER	4	1	3.1	<0.6	0.7	85	2	83	1	14	127	2	0.01	0.2	1.4	2	7.8	0.02	NL
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

-- -NOT AVAILABLE
HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
NL -NON LETHAL
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.
(2) -GRAB SAMPLE
(3) -24-HOUR COMPOSITE SAMPLE
< -LESS THAN
> -GREATER THAN

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:6 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF GREAT LAKES FOREST PRODUCTS LIMITED, DRYDEN, EFFLUENT.

	PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION																				
DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANNINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	(1) LC50
AUGUST 23,1982: FINAL EFFLUENT	100	50	--	--	60	1060	55	1005	390	1120	1310	21	0.28	1.3	229	220	6.5	0.05	NL
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

-- -NOT AVAILABLE
HZ -HAZEN UNITS
US/CM -MICROSIEMENS
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
NL -NON LETHAL
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.

TABLE:7 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT.

	PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION																			
DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANNINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	LC50 (1)
JUNE 8,1982: FINAL EFFLUENT	60	400	162	2400	400	2440	110	2330	2160	1600	1750	11	0.78	2.9	309	373	6.3	0.05	26 (2)
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.
(2) -SPLIT SAMPLE

TABLE:8 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF JAMES RIVER MARATHON LTD., (FORMERLY: AMERICAN CAN CANADA INC.), EFFLUENTS.

	PHYSICAL,CHEMICAL AND BIOLOGICAL CHARACTERIZATION																		
DATE SAMPLED/ SAMPLE DESCRIPTION	DOC	TANNINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	LC50 (1)
JUNE 22,1982:																			
FINAL EFFLUENT	127	30	158	120	280	2140	230	1910	1200	2424	2450	1.7	0.410	1.80	469	630	9.8	0.15	87
MAIN MILL EFFLUENT	365	400	172	6400	140	1460	225	1235	780	--	1590	--	0.280	2.90	255	370	10.3	0.07	--
ACIDIC SEWER EFFLUENT	233	50	180	116	300	2080	11	2069	940	--	11900	--	2.400	1.10	1814	320	1.8	0.19	--
ALKALINE SEWER EFFLUENT	245	100	142	3400	70	1140	70	1070	370	--	1540	--	0.043	0.28	308	356	9.8	0.02	--
AUGUST 16,1982:																			(2)
FINAL EFFLUENT	185	100	--	2600	240	1410	30	1380	770	1306	1910	25.0	0.320	1.90	443	370	3.9	1.70	<20
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

-- -NOT AVAILABLE
HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
< -LESS THAN
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.
(2) -SPLIT SAMPLE

TABLE:9 PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF KIMBERLY-CLARK OF CANADA LIMITED, TERRACE BAY, EFFLUENTS AND MILL INTAKE WATER.

DATE SAMPLED/ SAMPLE DESCRIPTION	PHYSICAL, CHEMICAL AND BIOLOGICAL CHARACTERIZATION																		
	DOC	TANNINS	SULPHATE	REACTIVE PHENOLICS	BOD	TOTAL SOLIDS	SUSPENDED SOLIDS	DISSOLVED SOLIDS	COD	COLOUR	CONDUCTIVITY	TURBIDITY	TP	TKN	CHLORIDE	SODIUM	PH	AMMONIA	(1) LC50
AUGUST 10,1982:																			
FINAL EFFLUENT	285	150	--	3400	280	1730	30	1700	970	1913	2430	4.2	0.43	2.50	548	430	3.5	1.60	25
JULY 10,1983:																			
FINAL EFFLUENT	260	--	85.0	2000	240	1550	30	1520	898	--	1820	--	0.08	2.10	461	340	4.5	0.90	18
MILL INTAKE WATER	2	--	4.0	0.4	0.3	65	1	64	8	--	99	--	0.01	.13	1.6	1.6	7.7	<.01	--
JULY 11,1983:																			
FINAL EFFLUENT	338	--	102.0	2460	540	1750	30	1720	1545	--	2470	--	0.38	2.80	631	370	3.0	2.1	8(2) 14(3)
MILL INTAKE WATER	10	--	4.0	0.4	0.8	70	1	69	5	--	99	--	0.01	.18	1.6	1.6	7.7	<.01	--
JULY 12,1983:																			
FINAL EFFLUENT	177	--	141.0	260	140	1520	25	1495	694	--	1840	--	0.51	1.00	440	350	4.5	0.2	26
MILL INTAKE WATER	2	--	4.5	<0.2	0.8	55	1	54	7	--	99	--	0.01	.16	1.5	1.4	7.7	<.01	--
JULY 13,1983:																			
FINAL EFFLUENT	273	--	99.0	2180	235	1650	30	1620	985	--	1960	--	0.53	2.50	346	360	4.1	1.6	19
MILL INTAKE WATER	2	--	6.0	0.2	0.6	75	1	74	18	--	99	--	0.01	.22	1.6	1.8	7.7	<.01	--
JULY 14,1983:																			
FINAL EFFLUENT	--	--	114.0	--	245	1460	30	1430	976	--	1630	--	0.41	3.00	381	320	5.5	1.0	42
MILL INTAKE WATER	2	--	4.5	<0.2	0.5	90	1	89	2	--	101	--	0.01	.16	2.0	2.2	7.8	<.01	--
ALL CONCENTRATIONS	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L	MG/L	MG/L	HZ	US/CM	FTU	MG/L	MG/L	MG/L	MG/L	SU	MG/L	%

-- -NOT AVAILABLE
HZ -HAZEN UNITS
US/CM -MICROSIEMENS/CM
FTU -FORMAZIN TURBIDITY UNITS
SU -STANDARD UNITS
DOC -DISSOLVED ORGANIC CARBON
BOD -BIOLOGICAL OXYGEN DEMAND
COD -CHEMICAL OXYGEN DEMAND
TP -TOTAL PHOSPHORUS
TKN -TOTAL KJELDAHL NITROGEN
(1) -FISH BIOASSAY-% CONCENTRATION LETHAL TO 50% OF FISH IN 96 HOURS.
(2) -GRAB SAMPLE
(3) -24-HOUR COMPOSITE SAMPLE
< -LESS THAN

TABLE:10 BACTERIAL COUNTS IN ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	HETEROTROPHS (1)	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
JULY 7,1982:							
GROUNDWOOD EFFLUENT	<100	<100	6800	240000	<100	<100	300
PAPER MILL EFFLUENT	5800	<100	<100	9900	<100	<100	--
AUGUST 4,1982:							
FINAL EFFLUENT	A 20000	<100	<100	1400000	<10	<100	92

-- -NOT AVAILABLE
(1) -COUNTS PER 1 ML
A -APPROXIMATELY
< -LESS THAN

TABLE:11 BACTERIAL COUNTS IN ABITIBI PRICE INC., FORT WILLIAM DIVISION, EFFLUENTS.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	HETEROTROPHS (1)	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
JULY 21,1982:							
COMBINED FINAL EFFLUENT*	3500000	A 50000	2800	4200000	--	A 20000	<3000
FINAL EFFLUENT**	820000	26000	1800	6000000	--	A 50000	<3000
WOODROOM EFFLUENT	15000000	A 40000	6700	5500000	--	A 40000	>1100000
SCMP EFFLUENT	43000	A 4000	3000	29000	--	A 2000	240000

-- -NOT AVAILABLE
(1) -COUNTS PER 1 ML
* -NO.1 & NO.2 LAGOON EFFLUENTS AND WOODROOM EFFLUENT
** -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP-SEMI CHEMICAL MECHANICAL PULPING
A -APPROXIMATELY
< -LESS THAN
> -GREATER THAN

TABLE:12 BACTERIAL COUNTS IN ABITIBI PRICE INC.,
THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	HETEROTROPHS (1)	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
JUNE 3,1982:							
FINAL EFFLUENT	--	--	--	--	--	--	24000
JUNE 16,1982:							
FINAL EFFLUENT	5100	<10	160	6700000	A 30	<10	43000
JULY 21,1982:							
FINAL EFFLUENT	A620000	A 200	1400	--	--	<100	240000
MILL INTAKE WATER	370	84	172	--	--	--	<300
JULY 22,1982:							
FINAL EFFLUENT	460000	A 300	3800	--	--	--	240000
MILL INTAKE WATER	A 700	<4	4	--	--	--	150
JULY 23,1982:							
FINAL EFFLUENT	260000	A 50	4700	--	A 200	--	150000
MILL INTAKE WATER	A 200	<4	12	--	<2	--	23

-- -NOT AVAILABLE
(1) -COUNTS PER 1 ML
A -APPROXIMATELY
< -LESS THAN

TABLE:13 BACTERIAL COUNTS IN BOISE CASCADE CANADA LIMITED, FORT FRANCES, EFFLUENTS.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	(1) HETEROTROPHS	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
JULY 13,1982:							
FINAL EFFLUENT	2500000	3300000	810000	60000000	A 100	<100000	>11000
SECONDARY LAGOON INFLUENT	25000	27000	8900	37000	A 100	<1000	240
SECONDARY LAGOON EFFLUENT	5200000	4600000	720000	110000000	<100	<100000	>11000

-- -NOT AVAILABLE
(1) -COUNTS PER 1 ML
A -APPROXIMATELY
< -LESS THAN
> -GREATER THAN

TABLE:14 BACTERIAL COUNTS IN DOMTAR PACKAGING/KRAFT PAPER AND BOARD DIVISION, RED ROCK MILL, EFFLUENTS AND MILL INTAKE WATER.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	(1) HETEROTROPHS	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
JUNE 14,1982:							
FINAL EFFLUENT*	12000000	A 100	A 900	15000000	A 40	A 100	2400000
JULY 5,1982:							
WOODROOM EFFLUENT:							
ALUM UNTREATED	240000	A 8000	<1000	32000000	A 6000	<1000	1500000
ALUM TREATED	A 6000	<1000	<1000	2000000	<1000	<1000	43000
JULY 17,1983:							
FINAL EFFLUENT *	A 100000	<10000	<1000	22000000	<100	<1000	460000
MILL INTAKE WATER	A 520	8	<4	2350	<2	--	430
JULY 18,1983:							
FINAL EFFLUENT *	A 300000	A 2000	A 700	13500000	<100	A 200	>1100000
MILL INTAKE WATER	A 480	<4	<4	3800	<2	--	43
JULY 19,1983:							
FINAL EFFLUENT *	A 90000	A 1300	<100	8500000	<100	A 400	1100000
MILL INTAKE WATER	100	<4	<4	A 1500	<2	--	92
JULY 20,1983:							
FINAL EFFLUENT *	A 370000	A 4000	A 100	3300000	A 100	A 100	93000
MILL INTAKE WATER	220	<4	4	A 2500	<2	8	93
JULY 21,1983:							
FINAL EFFLUENT *	A 400000	A 2000	<100	26500000	<100	<1000	1100000
MILL INTAKE WATER	570	16	4	3000	2	--	39

-- -NOT AVAILABLE
(1) -COUNTS PER 1 ML
A -APPROXIMATELY
< -LESS THAN
> -GREATER THAN

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:15 BACTERIAL COUNTS IN GREAT LAKES FOREST PRODUCTS LIMITED, DRYDEN, EFFLUENT.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	(1) HETEROTROPHS	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
AUGUST 23,1982: FINAL EFFLUENT	69000000	<10000	2500	--	<100	<10000	93000

-- -NOT AVAILABLE
(-COUNTS PER 1 ML
< -LESS THAN

TABLE:16 BACTERIAL COUNTS IN GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)							
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	HETEROTROPHS (1)	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
JUNE 8,1982: FINAL EFFLUENT	44000000	3600000	A 200	6600000	<100	--	23000

-- -NOT AV (BLE
(1) -COUNTS PER 1 ML
A -APPROXIMATELY
< -LESS THAN

TABLE:17 BACTERIAL COUNTS IN JAMES RIVER MARATHON LTD.,
(FORMERLY: AMERICAN CAN CANADA LTD.), MARATHON, EFFLUENTS.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	(1) HETEROTROPHS	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
JUNE 22,1982:							
FINAL EFFLUENT	<100	<10	A 50	1100	<10	<10	<300
MAIN MILL EFFLUENT	<10	<10	140	485	<10	<10	<300
ACIDIC SEWER EFFLUENT	<10	<10	<10	<10	<10	<10	<300
ALKALINE SEWER EFFLUENT	<100	<10	<10	<10	<10	<10	<300
AUGUST 16,1982:							
FINAL EFFLUENT	<10	<10	<10	<10	<10	<10	4

-- -NOT AVAILABLE
(1) -COUNTS PER 1 ML
A -APPROXIMATELY
< -LESS THAN

TABLE:18 BACTERIAL COUNTS IN KIMBERLY-CLARK OF CANADA LIMITED, TERRACE BAY, EFFLUENT.

DATE SAMPLED/ SAMPLE DESCRIPTION	BACTERIA (COUNTS PER 100 ML)						
	TOTAL COLIFORMS	FECAL COLIFORMS	FECAL STREPTOCOCCI	HETEROTROPHS (1)	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI	SULPHATE REDUCERS
AUGUST 10,1982: FINAL EFFLUENT	<100	<100	<100	<100	<100	<100	390

-- -NOT AVAILABLE (1) -COUNTS PER 1 ML
< -LESS THAN

TABLE:19 INORGANIC TRACE CONTAMINANTS IN ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
JULY 7,1982:															
GROUNDWOOD EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.02	<0.005
PAPER MILL EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.02	<0.005
AUGUST 4,1982:															
FINAL EFFLUENT	<0.05	0.57	<0.001	<0.005	<0.02	0.02	0.018	0.33	0.089	<0.05	<0.02	<0.03	0.18	<0.02	<0.005

-- -NOT AVAILABLE
(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

TABLE:20 INORGANIC TRACE CONTAMINANTS IN ABITIBI PRICE INC., FORT WILLIAM DIVISION, EFFLUENTS.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
JULY 21,1982:															
COMBINED FINAL EFFLUENT*	<0.05	2.0	0.001	0.005	<0.02	0.04	0.03	4.3	0.67	<0.02	<0.02	<0.03	0.08	2.00	<0.005
FINAL EFFLUENT*	<0.05	2.0	<0.001	0.005	<0.02	0.03	0.02	1.8	0.41	<0.02	<0.02	<0.03	0.06	0.19	<0.005
WOODROOM EFFLUENT	<0.05	2.2	0.002	0.007	<0.02	0.08	0.03	7.7	1.20	0.02	<0.02	<0.03	0.11	7.50	<0.005
SCMP EFFLUENT	0.16	3.6	<0.001	<0.005	<0.02	0.06	0.09	1.7	0.56	0.02	<0.02	0.03	2.10	<0.02	<0.005

(1) -CONCENTRATIONS IN UG/L = PPB
* -NO.1 & NO.2 LAGOON EFFLUENTS AND WOODROOM EFFLUENT
** -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP-SEMI CHEMICAL MECHANICAL PULPING
< -LESS THAN

TABLE:21 INORGANIC TRACE CONTAMINANTS IN ABITIBI PRICE INC., THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
JUNE 3,1982:															
FINAL EFFLUENT	0.07	1.10	0.001	<0.0050	<0.020	0.080	<0.010	0.95	0.500	--	<0.020	<0.030	0.080	<0.02	<0.005
JUNE 16,1982:															
FINAL EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	0.12	--
JULY 21,1982:															
FINAL EFFLUENT	0.88	0.65	0.005	<0.0002	0.002	0.004	0.011	--	--	--	0.004	0.007	0.046	0.02	<0.005
MILL INTAKE WATER	<0.05	0.12	<0.001	<0.0002	<0.001	<0.001	0.005	--	--	--	<0.001	<0.003	0.006	<0.01	<0.005
JULY 22,1982:															
FINAL EFFLUENT	<0.05	0.65	0.006	0.0004	0.003	0.002	0.013	--	--	--	0.005	0.006	0.050	0.03	<0.005
MILL INTAKE WATER	<0.05	0.06	<0.001	<0.0002	<0.001	<0.001	0.003	--	--	--	<0.001	<0.003	0.008	<0.01	<0.005
JULY 23,1982:															
FINAL EFFLUENT	<0.05	--	0.002	--	--	--	--	--	--	--	--	--	--	0.03	<0.005
MILL INTAKE WATER	<0.05	0.04	<0.001	<0.0002	<0.001	<0.001	0.004	--	--	--	<0.001	<0.003	0.007	<0.01	<0.005

-- -NOT AVAILABLE
(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

TABLE:22 INORGANIC TRACE CONTAMINANTS IN BOISE CASCADE CANADA LIMITED, FORT FRANCES, EFFLUENTS.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
JULY 13,1982:															
FINAL EFFLUENT	<0.05	0.55	<0.001	<0.005	<0.02	0.05	0.01	2.0	0.51	<0.02	<0.02	<0.03	0.09	0.81	<0.005
SECONDARY LAGOON INFLUENT	<0.05	0.40	<0.001	<0.005	<0.02	0.06	0.01	2.5	0.56	<0.02	<0.02	<0.03	0.12	9.00	<0.005
SECONDARY LAGOON EFFLUENT	<0.05	0.70	<0.001	<0.005	<0.02	0.07	0.10	2.5	0.71	<0.02	<0.02	<0.03	0.11	--	<0.005

-- -NOT AVAILABLE
(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

TABLE:23 INORGANIC TRACE CONTAMINANTS IN DOMTAR PACKAGING/KRAFT PAPER AND BOARD DIVISION RED ROCK MILL, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
JUNE 14,1982:															
FINAL EFFLUENT *	0.39	4.0	<0.001	<0.0050	<0.02	0.030	<0.020	0.63	0.27	--	<0.020	0.060	.050	<0.02	<0.005
JULY 5,1982:															
WOODROOM EFFLUENT															
ALUM UNTREATED	0.35	170.0	0.005	<0.0050	<0.02	0.230	0.050	34.00	1.60	0.03	<0.020	0.030	.320	0.61	<0.005
ALUM TREATED	0.16	4.9	0.006	<0.0050	<0.02	0.230	0.040	19.00	1.80	0.03	<0.020	0.070	.310	0.55	<0.005
JULY 17,1983:															
FINAL EFFLUENT *	<0.05	4.4	0.001	0.0003	.001	0.100	0.015	0.53	--	--	0.003	<0.003	.033	.012	<0.001
MILL INTAKE WATER	<0.05	0.1	0.001	<0.0002	<.001	0.006	0.004	0.29	--	--	<0.001	<0.003	.009	<.001	<0.001
JULY 18,1983:															
FINAL EFFLUENT *	<0.05	3.8	<.001	0.0003	.001	0.006	0.011	0.46	--	--	0.003	<0.003	.028	.019	<0.001
MILL INTAKE WATER	<0.05	0.2	<.001	<0.0002	<.001	<0.001	0.007	0.16	--	--	0.001	<0.003	.012	<.001	<0.001
JULY 19,1983:															
FINAL EFFLUENT *	<0.05	3.4	.001	<0.0002	.001	0.006	0.015	0.42	--	--	0.001	<0.003	.025	.007	<0.001
MILL INTAKE WATER	<0.05	0.1	<.001	<0.0002	<.001	0.001	0.004	0.16	--	--	<0.001	<0.003	.009	<.001	<0.001
JULY 20,1983:															
FINAL EFFLUENT *	<0.05	3.8	<.001	0.0004	.001	0.006	0.015	0.56	--	--	0.003	<0.003	.027	.082	<0.001
MILL INTAKE WATER	<0.05	0.1	<.001	<0.0002	<.001	<0.001	0.006	0.14	--	--	0.001	<0.003	.011	<.001	<0.001
JULY 21,1983:															
FINAL EFFLUENT *	<0.05	3.8	--	0.0004	.001	0.006	0.016	0.47	--	--	0.003	<0.003	.037	.091	<0.001
MILL INTAKE WATER	<0.05	0.1	--	<0.0002	<.001	<0.001	0.002	0.16	--	--	<0.001	<0.003	.008	<.001	<0.001

ND -NOT DETECTED
-- -NOT AVAILABLE
(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:24 INORGANIC TRACE CONTAMINANTS IN GREAT LAKES FOREST PRODUCTS LIMITED, DRYDEN, EFFLUENT.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)														
	MERCURY (1)	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
AUGUST 23,1982:															
FINAL EFFLUENT	<0.05	1.4	<0.001	<0.005	<0.02	0.21	0.01	2.4	0.30	<0.05	0.05	<0.03	0.06	0.10	<0.005

(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

TABLE:25 INORGANIC TRACE CONTAMINANTS IN GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
JUNE 8,1982:															
FINAL EFFLUENT	0.27	13.0	<0.001	<0.005	<0.02	0.10	0.03	2.5	0.09	--	<0.02	<0.03	0.13	--	<0.005

-- -NOT AVAILABLE
(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

TABLE:26 INORGANIC TRACE CONTAMINANTS IN JAMES RIVER MARATHON LTD., (FORMERLY: AMERICAN CAN CANADA INC.), EFFLUENTS.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
JUNE 22,1982:															
FINAL EFFLUENT	0.15	0.45	<0.001	<0.005	<0.02	0.13	0.02	2.7	0.62	0.03	0.02	<0.03	0.16	0.46	0.045
MAIN MILL EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	211.00	0.008
ACIDIC SEWER EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	0.44	--
ALKALINE SEWER EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	10.00	0.040
AUGUST 16,1982:															
FINAL EFFLUENT	0.20	0.23	<0.001	<0.005	<0.02	0.07	0.01	1.4	0.35	--	<0.02	<0.03	0.07	0.06	<0.005

-- -NOT AVAILABLE
(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

TABLE:27 INORGANIC TRACE CONTAMINANTS IN KIMBERLY-CLARK OF CANADA LIMITED, TERRACE BAY, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS OF INORGANIC TRACE CONTAMINANTS (MG/L = PPM)

DATE SAMPLED/ SAMPLE DESCRIPTION	(1) MERCURY	ALUMINUM	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER	IRON	MANGANESE	MOLYBDENUM	NICKEL	LEAD	ZINC	HYDROGEN SULPHIDE	CYANIDE
AUGUST 10,1982:															
FINAL EFFLUENT	<0.05	0.39	<0.001	<0.0050	<0.02	0.060	0.010	2.10	0.47	<0.05	0.03	<0.030	0.070	0.03	<0.005
JULY 10,1983:															
FINAL EFFLUENT	<0.05	0.43	--	<0.0050	--	<0.020	0.020	0.64	--	--	--	<0.030	<0.010	0.013	--
MILL INTAKE WATER	<0.05	<0.01	--	0.0010	--	0.002	0.003	0.04	--	--	--	0.003	0.005	<0.001	--
JULY 11,1983:															
FINAL EFFLUENT	0.19	0.62	--	0.0050	--	<0.020	<0.010	0.82	--	--	--	<0.030	0.055	0.017	--
MILL INTAKE WATER	0.07	0.03	--	0.0005	--	0.002	0.003	0.04	--	--	--	<0.003	0.004	<0.001	--
JULY 12,1983:															
FINAL EFFLUENT	<0.05	0.76	--	<0.0050	--	<0.020	<0.010	0.94	--	--	--	<0.030	0.075	0.002	--
MILL INTAKE WATER	<0.05	0.02	--	0.0005	--	<0.002	0.004	0.05	--	--	--	<0.003	0.003	<0.001	--
JULY 13,1983:															
FINAL EFFLUENT	0.12	0.66	--	0.0050	--	<0.020	<0.010	0.64	--	--	--	<0.030	0.075	0.004	--
MILL INTAKE WATER	0.06	0.02	--	0.0015	--	<0.002	0.011	0.04	--	--	--	0.006	0.004	<0.001	--
JULY 14,1983:															
FINAL EFFLUENT	0.05	0.66	--	0.0050	--	0.030	<0.010	0.62	--	--	--	<0.030	0.065	0.009	--
MILL INTAKE WATER	<0.05	0.02	--	<0.0015	--	0.003	0.004	0.05	--	--	--	<0.003	0.004	<0.001	--

ND -NOT DETECTED
-- -NOT AVAILABLE
(1) -CONCENTRATIONS IN UG/L = PPB
< -LESS THAN

TABLE:28 FATTY, AROMATIC AND RESIN ACIDS IN ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS.

	CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS																			
	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS							
DATE SAMPLED/ SAMPLE DESCRIPTION	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-	PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-	ABIETIC
JULY 7,1982:																				
GROUNDWOOD EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	698	ND	ND	1403	ND	606	86	
PAPER MILL EFFLUENT	ND	ND	ND	291	421	70	239	ND	ND	ND	ND	ND	59	ND	149	ND	ND	736	ND	
AUGUST 4,1982:																				
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
DETECTION LIMIT	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40	

ND -NOT DETECTED

TABLE:29 FATTY, AROMATIC AND RESIN ACIDS IN ABITIBI PRICE INC., FORT WILLIAM DIVISION, EFFLUENTS.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

DATE SAMPLED/ SAMPLE DESCRIPTION	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-	PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-	ABIETIC
JULY 21,1982:																					
COMBINED FINAL EFFLUENT*	ND	ND	ND	318	ND	1244	4801	1080	ND	ND	ND	ND	1795	3183	2612	5224	23239	15810	1187		
FINAL EFFLUENT**	ND	ND	ND	ND	172	213	1176	220	ND	ND	ND	ND	110	585	411	600	2052	2372	545		
WOODROOM EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	195	114	ND	ND	290	ND		
SCMP EFFLUENT	ND	ND	ND	214	129	1524	7058	1588	ND	ND	ND	ND	770	3640	2742	4640	23040	15301	1309		
DETECTION LIMITS	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40		

ND -NOT DETECTED
* -NO.1 & NO.2 LAGOON EFFLUENTS AND WOODROOM EFFLUENT
** -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP-SEMI CHEMICAL MECHANICAL PULPING

TABLE:30 FATTY, AROMATIC AND RESIN ACIDS IN ABITIBI PRICE INC., THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

DATE SAMPLED/ SAMPLE DESCRIPTION	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-ABIETIC
JUNE 3,1982: FINAL EFFLUENT	ND	ND	ND	84	ND	229	646	ND	ND	ND	ND	ND	65	199	355	483	332	3606	488
JUNE 16,1982: FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	233	88
JULY 21,1982: FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 22,1982: FINAL EFFLUENT	ND	ND	ND	134	ND	297	1310	236	ND	ND	ND	ND	758	747	998	1701	8066	5509	459
JULY 23,1982: FINAL EFFLUENT	ND	ND	ND	108	ND	254	1102	212	ND	ND	ND	ND	611	1227	ND	1377	7062	4357	323
DETECTION LIMIT	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40

ND -NOT DETECTED

TABLE:31 FATTY, AROMATIC AND RESIN ACIDS IN BOISE CASCADE CANADA LIMITED FORT FRANCES, EFFLUENTS.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
DATE SAMPLED/ SAMPLE DESCRIPTION	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-ABIETIC
JULY 13,1982:																			
FINAL EFFLUENT	ND	ND	ND	116	ND	273	3219	204	ND	ND	ND	ND	273	388	545	875	2766	2698	289
SECONDARY LAGOON INFLUENT	ND	ND	ND	61	77	226	898	ND	ND	ND	ND	ND	342	525	581	622	2054	2645	282
SECONDARY LAGOON EFFLUENT	ND	ND	101	56	ND	122	ND	ND	ND	ND	ND	ND	252	298	472	ND	ND	779	104
DETECTION LIMIT	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40

ND -NOT DETECTED

TABLE:32 FATTY, AROMATIC AND RESIN ACIDS IN DOMTAR PACKAGING/KRAFT PAPER AND BOARD DIVISION RED ROCK MILL, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

DATE SAMPLED/ SAMPLE DESCRIPTION	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-ABIETIC
JUNE 14,1982:																			
FINAL EFFLUENT*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	130	154	ND	136	ND	92	ND
JULY 5,1982:																			
WOODROOM EFFLUENT:																			
ALUM UNTREATED	ND	ND	ND	ND	ND	542	2356	140	ND	452	ND	ND	ND	1238	1166	2128	5470	7522	909
ALUM TREATED	ND	ND	ND	ND	ND	868	3472	187	ND	664	ND	ND	349	1650	1666	2619	9846	15044	1111
JULY 17,1983:																			
FINAL EFFLUENT*	2	8	5	48	14	64	137	2	4	85	22	ND	93	43	74	130	ND	392	273
MILL INTAKE WATER	2	ND	1	5	3	2	3	ND	ND	11	ND	ND	5	ND	ND	2	2	ND	2
JULY 18,1983:																			
FINAL EFFLUENT*	ND	ND	7	28	16	63	75	2	13	ND	39	ND	199	135	187	361	ND	1800	563
MILL INTAKE WATER	ND	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 19,1983:																			
FINAL EFFLUENT*	6	ND	6	17	11	37	ND	4	12	ND	48	ND	147	101	135	257	ND	1210	476
MILL INTAKE WATER	2	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	ND
JULY 20,1983:																			
FINAL EFFLUENT*	7	2	9	106	25	ND	ND	34	16	3	50	16	156	106	61	282	ND	1020	681
MILL INTAKE WATER	ND	ND	1	12	13	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	1
JULY 21,1983:																			
FINAL EFFLUENT*	7	12	11	89	18	ND	6	17	ND	5	42	ND	161	91	ND	332	ND	189	657
MILL INTAKE WATER	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2	ND
DETECTION LIMIT (1982)	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40
DETECTION LIMIT (1983)	1	1	1	1	2	2	4	2	3	2	2	2	1	1	1	1	1	1	1

ND -NOT DETECTED

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:33 FATTY, AROMATIC AND RESIN ACIDS IN GREAT LAKES FOREST PRODUCTS, LIMITED, DRYDEN, EFFLUENT.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
DATE SAMPLED/ SAMPLE DESCRIPTION	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-ABIETIC
AUGUST 23,1982: FINAL EFFLUENT	ND	ND	ND	ND	ND	33	ND	24	ND	ND	ND	ND	118	315	197	301	142	1354	137
DETECTION LIMIT	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40

ND -NOT DETECTED

TABLE:34 FATTY, AROMATIC AND RESIN ACIDS IN GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
DATE SAMPLED/ SAMPLE DESCRIPTION	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-ABIETIC
JUNE 8,1982: FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	103	83	ND	ND	232	ND
DETECTION LIMIT	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40

ND -NOT DETECTED

TABLE:35 FATTY, AROMATIC AND RESIN ACIDS IN JAMES RIVER MARATHON LTD., (FORMERLY: AMERICAN CAN CANADA INC.), EFFLUENTS.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

DATE SAMPLED/ SAMPLE DESCRIPTION	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-ABIETIC
JUNE 22,1982:																			
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	131	ND	ND	123	ND	48	ND
MAIN MILL EFFLUENT	ND	ND	ND	ND	ND	1406	3333	ND	ND	ND	ND	ND	419	ND	960	393	656	5740	485
ACIDIC SEWER EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ALKALINE SEWER EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	175	154	ND	ND	ND	241	ND
AUGUST 16,1982:																			
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200	ND	823	145
DETECTION LIMIT	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40

ND -NOT DETECTED

TABLE:36 FATTY, AROMATIC AND RESIN ACIDS IN KIMBERLY-CLARK OF CANADA LTD., TERRACE BAY, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (UG/L = PPB) OF FATTY, AROMATIC AND RESIN ACIDS

	FATTY ACIDS									AROMATIC ACIDS			RESIN ACIDS						
DATE SAMPLED/ SAMPLE DESCRIPTION	CAPRIC	LAURIC	MYRISTIC	PALMITIC	STEARIC	OLEIC	LINOLEIC	LINOLENIC	ARACHIDIC	BENZOIC	SALICYLIC	PHTHALIC	PIMARIC	SANDARACO-PIMARIC	LEVOPIMARIC	ISOPIMARIC	NEOABIETIC	ABIETIC	DEHYDRO-ABIETIC
AUGUST 10,1982:																			
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 10,1983:																			
FINAL EFFLUENT	6	2	3	80	10	66	222	2	ND	232	37	23	231	133	ND	274	ND	805	550
MILL INTAKE WATER	ND	ND	ND	4	ND	ND	4	ND	ND	3	ND	ND	5	ND	ND	1	ND	ND	2
JULY 11,1983:																			
FINAL EFFLUENT	--	51	22	64	6	51	168	ND	6	--	--	ND	197	275	125	365	ND	1300	523
MILL INTAKE WATER	ND	ND	ND	1	ND	ND	ND	ND	ND	6	ND	ND	5	5	ND	ND	2	ND	1
JULY 12,1983:																			
FINAL EFFLUENT	5	4	10	89	24	53	398	5	8	301	8	23	120	61	305	102	ND	404	236
MILL INTAKE WATER	ND	ND	ND	3	2	ND	6	ND	ND	16	ND	ND	6	ND	ND	1	1	ND	1
JULY 13,1983:																			
FINAL EFFLUENT	7	9	20	122	28	52	485	7	17	234	25	23	170	133	560	194	ND	756	333
MILL INTAKE WATER	ND	ND	ND	3	ND	ND	ND	ND	ND	17	ND	ND	5	ND	ND	ND	ND	ND	4
JULY 14,1983:																			
FINAL EFFLUENT	5	22	4	18	10	8	60	ND	ND	266	28	ND	292	106	227	384	ND	278	760
MILL INTAKE WATER	ND	ND	1	4	ND	ND	ND	ND	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT(1982)	10	10	10	10	10	10	10	10	10	10	10	10	40	40	40	40	40	40	40
DETECTION LIMIT(1983)	1	1	1	1	2	2	4	2	3	2	2	2	1	1	1	1	1	1	1

ND -NOT DETECTED

TABLE:37 SPECIFIC PHENOLIC COMPOUNDS IN ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS																			
	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLORO-P-CRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
JULY 7,1982:																				
GROUNDWOOD EFFLUENT	40	5	21	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAPER MILL EFFLUENT	17	5	ND	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUGUST 4,1982:																				
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

TABLE:38 SPECIFIC PHENOLIC COMPOUNDS IN ABITIBI PRICE INC., FORT WILLIAM DIVISION, EFFLUENTS.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS																			
	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLORO-PCRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
JULY 21,1982:																				
COMBINED FINAL EFFLUENT*	ND	302	ND	ND	ND	94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FINAL EFFLUENT**	ND	288	ND	ND	ND	58	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WOODROOM EFFLUENT	ND	162	540	576	ND	171	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SCMP EFFLUENT	ND	178	ND	ND	ND	130	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
* -NO.1 & NO.2 LAGOON EFFLUENTS AND WOODROOM EFFLUENT
** -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP-SEMI CHEMICAL MECHANICAL PULPING
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

TABLE:39 SPECIFIC PHENOLIC COMPOUNDS IN ABITIBI PRICE INC., THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS																		
	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLORO-P-CRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
JUNE 3,1982: FINAL EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
JUNE 16,1982: FINAL EFFLUENT	ND	122	90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 21,1982: FINAL EFFLUENT	2600	140	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 22,1982: FINAL EFFLUENT	2400	130	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 23,1982: FINAL EFFLUENT	50	35	ND	140	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
-- -NOT AVAILABLE
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

TABLE:40 SPECIFIC PHENOLIC COMPOUNDS IN BOISE CASCADE CANADA LIMITED, FORT FRANCES, EFFLUENTS.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS																			
	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLORO-P-CRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
JULY 13,1982:																			
FINAL EFFLUENT	ND	ND	ND	27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SECONDARY LAGOON INFLUENT	ND	880	ND	1310	ND	173	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SECONDARY LAGOON EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

TABLE:41 SPECIFIC PHENOLIC COMPOUNDS IN DOMTAR PACKAGING/KRAFT PAPER AND BOARD DIVISION RED ROCK MILL, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS

DATE SAMPLED/ SAMPLE DESCRIPTION	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLORO-P-CRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
JUNE 14,1982:																			
FINAL EFFLUENT *	ND	216	180	1250	ND	64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 5,1982:																			
WOODROOM EFFLUENT																			
ALUM UNTREATED	13000	400	ND	2600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ALUM TREATED	17000	600	ND	2800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 17,1983:																			
FINAL EFFLUENT*	ND	13	ND	207	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 18,1983:																			
FINAL EFFLUENT*	ND	44	ND	1100	ND	33	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 19,1983:																			
FINAL EFFLUENT*	ND	29	ND	945	ND	38	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 20,1983:																			
FINAL EFFLUENT*	ND	43	ND	540	ND	75	ND	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 21,1983:																			
FINAL EFFLUENT*	ND	43	ND	1120	ND	52	ND	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
-- -NOT AVAILABLE
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:42 SPECIFIC PHENOLIC COMPOUNDS IN GREAT LAKES FOREST PRODUCTS LIMITED, DRYDEN, EFFLUENT.

	CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS																			
DATE SAMPLED/ SAMPLE DESCRIPTION	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLOROO-PCRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
AUGUST 23,1982: FINAL EFFLUENT	ND	72	ND	378	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

TABLE:43 SPECIFIC PHENOLIC COMPOUNDS IN GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS																			
	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLORO-P-CRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
JUNE 8,1982: FINAL EFFLUENT	ND	162	ND	1098	ND	288	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

TABLE:44 SPECIFIC PHENOLIC COMPOUNDS IN JAMES RIVER MARATHON LTD., (FORMERLY: AMERICAN CAN CANADA INC.), EFFLUENTS.

CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS

DATE SAMPLED/ SAMPLE DESCRIPTION	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLOROCRESOL	P-CRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	PCP
JUNE 22,1982:																			
FINAL EFFLUENT	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MAIN MILL EFFLUENT	ND	1656	ND	9450	ND	900	720	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACIDIC SEWER EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ALKALINE SEWER EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AUGUST 16,1982:																			
FINAL EFFLUENT	ND	144	ND	468	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
-- -NOT AVAILABLE
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOROPHENOL

TABLE:45 SPECIFIC PHENOLIC COMPOUNDS IN KIMBERLY-CLARK OF CANADA LIMITED, TERRACE BAY, EFFLUENT.

DATE SAMPLED/ SAMPLE DESCRIPTION	PHENOL	VANILLIN	HOMOVANILLIC ACID	GUAIACOL	SYRINGALDEHYDE	ACETOVANILLON	VANILLIC ACID	ACETOSYRINGONE	2,5-XYLENOL	P-CRESOL	M-CHLORO-P-CRESOL	2-CP	4-CP	2,4-DCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,4,5,6-TTCP	PCP
CONCENTRATIONS (UG/L = PPB) OF SPECIFIC PHENOLIC COMPOUNDS																			
AUGUST 10,1982: FINAL EFFLUENT	ND	216	270	612	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

ND -NOT DETECTED
CP -CHLOROPHENOL
DCP -DICHLOROPHENOL
TCP -TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP -PENTACHLOFOPHENOL

TABLE:46 CHLOROPHENOL CONCENTRATIONS IN ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
JULY 7,1982:						
GROUNDWOOD EFFLUENT	ND	ND	ND	ND	ND	300
PAPER MILL EFFLUENT	ND	ND	ND	ND	ND	250
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
AUGUST 4,1982:						
FINAL EFFLUENT	--	--	--	--	--	--
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
-- -NOT AVAILABLE
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:47 CHLOROPHENOL CONCENTRATIONS IN ABITIBI PRICE INC., FORT WILLIAM DIVISION, EFFLUENTS AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
JULY 21,1982:						
COMBINED FINAL EFFLUENT*	ND	ND	ND	ND	ND	100
FINAL EFFLUENT**	ND	ND	150	ND	ND	100
WOODROOM EFFLUENT	350	100	ND	ND	ND	200
SCMP EFFLUENT	ND	ND	ND	ND	ND	400
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
* -NO.1 & NO.2 LAGOON EFFLUENTS & WOODROOM EFFLUENT
** -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP-SEMI CHEMICAL MECHANICAL PULPING
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:48 CHLOROPHENOL CONCENTRATIONS IN ABITIBI PRICE INC., THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
JUNE 3,1982:						
FINAL EFFLUENT	--	--	--	--	--	--
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JUNE 16,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	250	ND	ND	ND
JULY 21,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	200	ND
MILL INTAKE WATER	--	--	--	--	--	--
JULY 22,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND
JULY 23,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	100
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
-- -NOT AVAILABLE
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:49 CHLOROPHENOL CONCENTRATIONS IN BOISE CASCADE CANADA LIMITED, FORT FRANCES, EFFLUENTS AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
JULY 13,1982:						
FINAL EFFLUENT	4200	ND	2000	ND	1000	1000
SECONDARY LAGOON INFLUENT	2200	ND	2000	ND	1400	1000
SECONDARY LAGOON EFFLUENT	5100	ND	1000	ND	1500	1100
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:50 CHLOROPHENOL CONCENTRATIONS IN DOMTAR PACKAGING/KRAFT PAPER, AND BOARD DIVISION RED ROCK MILL, EFFLUENTS AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
JUNE 14,1982:						
FINAL EFFLUENT *	ND	ND	2100	ND	ND	100
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 5,1982:						
WOODROOM EFFLUENT:						
ALUM UNTREATED	ND	ND	ND	ND	ND	250
ALUM TREATED	ND	ND	ND	ND	ND	100
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 17,1983:						
FINAL EFFLUENT *	ND	ND	6600	ND	ND	760
MILL INTAKE WATER	ND	ND	5100	ND	ND	ND
JULY 18,1983:						
FINAL EFFLUENT *	ND	ND	1250	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 19,1983:						
FINAL EFFLUENT *	ND	ND	200	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 20,1983:						
FINAL EFFLUENT *	ND	ND	300	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 21,1983:						
FINAL EFFLUENT *	ND	ND	1300	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:51 CHLOROPHENOL CONCENTRATIONS IN GREAT LAKES FOREST PRODUCTS LIMITED, DRYDEN, EFFLUENT AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
AUGUST 23,1982:						
FINAL EFFLUENT	ND	ND	90	ND	250	100
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:52 CHLOROPHENOL CONCENTRATIONS IN GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,4,5-TCP	2,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
JULY 8,1982:						
FINAL EFFLUENT	600	ND	450	ND	150	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:53 CHLOROPHENOL CONCENTRATIONS IN JAMES RIVER MARATHON LTD., (FORMERLY: AMERICAN CAN CANADA INC.) MARATHON, EFFLUENTS AND MILL INTAKE WATER.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
	2,3,4-TTCP	2,4,5-TTCP	2,4,6-TTCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
JUNE 22,1982:						
FINAL EFFLUENT	3800	ND	3200	ND	800	350
MAIN MILL EFFLUENT	ND	ND	ND	ND	ND	ND
ACIDIC SEWER EFFLUENT	12400	ND	15300	ND	4600	ND
ALKALINE SEWER EFFLUENT	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
AUGUST 16,1982:						
FINAL EFFLUENT	7450	ND	320	ND	420	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:54 CHLOROPHENOL CONCENTRATIONS IN KIMBERLY-CLARK OF CANADA LIMITED, TERRACE BAY, EFFLUENTS AND MILL INTAKE WATER.

	CONCENTRATIONS (NG/L = PPT) OF CHLOROPHENOLS					
DATE SAMPLED/ SAMPLE DESCRIPTION	2,3,4-TCP	2,3,4,5-TCP	2,3,4,6-TCP	2,3,4,5-TTCP	2,3,5,6-TTCP	PCP
AUGUST 10,1982:						
FINAL EFFLUENT	3800	ND	2600	ND	1600	2200
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 10,1983:						
FINAL EFFLUENT	ND	50	11600	ND	ND	870
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 11,1983:						
FINAL EFFLUENT	ND	ND	16200	200	ND	2250
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 12,1983:						
FINAL EFFLUENT	ND	ND	7800	ND	ND	820
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 13,1983:						
FINAL EFFLUENT	--	--	--	--	--	--
MILL INTAKE WATER	--	--	--	--	--	--
JULY 14,1983:						
FINAL EFFLUENT	ND	ND	11000	ND	ND	1100
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	100	50	50	50	50	50

ND -NOT DETECTED
TCP-TRICHLOROPHENOL
TTCP-TETRACHLOROPHENOL
PCP-PENTACHLOROPHENOL

TABLE:55 ORGANOHALIDES IN ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS.

	CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES					
DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLOROBROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
JULY 7,1982:						
GROUNDWOOD EFFLUENT	ND	ND	ND	ND	ND	ND
PAPER MILL EFFLUENT	ND	ND	ND	ND	ND	ND
AUGUST 4,1982:						
FINAL EFFLUENT	20	ND	ND	ND	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED

TABLE:56 ORGANOHALIDES IN ABITIBI PRICE INC.,
FORT WILLIAM DIVISION, EFFLUENTS.

CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLOROBROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
JULY 21,1982:						
COMBINED FINAL EFFLUENT*	11	ND	ND	ND	ND	ND
FINAL EFFLUENT**	13	ND	ND	ND	ND	ND
WOODROOM EFFLUENT	9	ND	ND	ND	ND	ND
SCMP EFFLUENT	19	ND	ND	ND	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED
* -NO.1 & NO.2 LAGOON EFFLUENTS & WOODROOM EFFLUENT
** -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP-SEMI CHEMICAL MECHANICAL PULPING

TABLE:57 ORGANOHALIDES IN ABITIBI PRICE INC.,
THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLOROBROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
JUNE 3,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND
JUNE 16,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND
JULY 21,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND
JULY 22,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND
JULY 23,1982:						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED

TABLE:58 ORGANOHALIDES IN BOISE CASCADE CANADA LIMITED, FORT FRANCES, EFFLUENTS.

	CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES					
DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLORO-BROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
JULY 13,1982:						
FINAL EFFLUENT	500	ND	ND	ND	ND	ND
SECONDARY LAGOON INFLUENT	ND	ND	ND	ND	ND	ND
SECONDARY LAGOON EFFLUENT	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED

TABLE:59 ORGANOHALIDES IN DOMTAR PACKAGING/KRAFT PAPER AND BOARD DIVISION RED ROCK MILL, EFFLUENTS.

CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLORO-BROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
JUNE 14,1982: FINAL EFFLUENT*	--	--	--	--	--	--
JULY 5,1982: WOODROOM EFFLUENT:						
ALUM UNTREATED	ND	ND	ND	ND	ND	ND
ALUM TREATED	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED
-- -NOT AVAILABLE

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:60 ORGANOHALIDES IN GREAT LAKES FOREST PRODUCTS LIMITED, DRYDEN, EFFLUENT.

	CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES					
DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLORO-BROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
AUGUST 23,1982: FINAL EFFLUENT	1639	ND	ND	ND	ND	10
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED

TABLE:61 ORGANOHALIDES IN GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT.

CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES							
DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLORO-BROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
JUNE 8,1982: FINAL EFFLUENT	4036	ND	ND	9	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED

TABLE:62 ORGANOHALIDES IN JAMES RIVER MARATHON LTD., (FORMERLY: AMERICAN CAN CANADA INC.), EFFLUENTS.

CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLOROBROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
JUNE 22,1982:						
FINAL EFFLUENT	8	ND	ND	ND	ND	ND
MAIN MILL EFFLUENT	ND	ND	ND	ND	ND	ND
ACIDIC SEWER EFFLUENT	3	ND	ND	ND	ND	ND
ALKALINE SEWER EFFLUENT	4	ND	ND	ND	ND	ND
AUGUST 16,1982:						
FINAL EFFLUENT	504	ND	ND	ND	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED

TABLE:63 ORGANOHALIDES IN KIMBERLY-CLARK OF CANADA LIMITED, TERRACE BAY, EFFLUENT.

DATE SAMPLED/ SAMPLE DESCRIPTION	CONCENTRATIONS (UG/L = PPB) OF ORGANOHALIDES					
	CHLOROFORM	CARBON TETRACHLORIDE	TRICHLORO-ETHYLENE	DICHLORO-BROMOMETHANE	CHLORO-DIBROMOMETHANE	TETRACHLORO-ETHYLENE
AUGUST 10,1982: FINAL EFFLUENT	613	ND	ND	ND	ND	ND
DETECTION LIMIT	1.0	0.1	2.0	0.5	1.0	0.5

ND -NOT DETECTED

TABLE:64 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN ABITIBI PRICE FINE PAPERS, PORT ARTHUR DIVISION, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DMDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHAN SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
JULY 7,1982:																						
GROUNDWOOD EFFLUENT	60	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAPER MILL EFFLUENT	ND	ND	4	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUGUST 4,1982																						
FINAL EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MILL INTAKE WATER	ND	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED
-- -NOT AVAILABLE

TABLE:65 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN ABITIBI PRICE INC., FORT WILLIAM DIVISION, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DHDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHAN SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
JULY 21,1982:																						
COMBINED FINAL EFFLUENT*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FINAL EFFLUENT**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WOODROOM EFFLUENT	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SCMP EFFLUENT	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED
* -NO.1 & NO.2 LAGOON EFFLUENTS AND WOODROOM EFFLUENT (* -NO.1 & NO.2 LAGOON EFFLUENTS
SCMP-SEMI CHEMICAL MECHANICAL PULPING

TABLE:66 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN ABITIBI PRICE INC., THUNDER BAY DIVISION, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DMDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHAN SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
JUNE 3,1982:																						
FINAL EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MILL INTAKE WATER	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JUNE 16,1982:																						
FINAL EFFLUENT	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	6	ND	1	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 21,1982:																						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 22,1982:																						
FINAL EFFLUENT	ND	ND	5	1	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 23,1982:																						
FINAL EFFLUENT	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED
-- -NOT AVAILABLE

TABLE:67 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN BOISE CASCADE CANADA LIMITED, FORT FRANCES, EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DMDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
JULY 13,1982:																						
FINAL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SECONDARY LAGOON INFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SECONDARY LAGOON EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED

TABLE:68 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN DOMTAR PACKAGING/KRAFT PAPER AND BOARD DIVISION RED ROCK MILL, EFFLUENTS AND MILL INTAKE WATER

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DMDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHAN SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
JUNE 14,1982:																						
FINAL EFFLUENT *	ND	ND	24	24	28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 5,1982:																						
WOODROOM EFFLUENT:																						
ALUM UNTREATED	235	2	18	26	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ALUM TREATED	970	ND	11	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 17,1983:																						
FINAL EFFLUENT *	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	ND
MILL INTAKE WATER	ND	ND	1	ND	ND	ND	6	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 18,1983:																						
FINAL EFFLUENT *	65	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND
MILL INTAKE WATER	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 19,1983:																						
FINAL EFFLUENT *	ND	ND	9	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND
MILL INTAKE WATER	ND	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 20,1983:																						
FINAL EFFLUENT *	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
JULY 21,1983:																						
FINAL EFFLUENT *	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED
-- -NOT AVAILABLE

* NOTE: Mill effluent samples from Domtar Packaging also contained effluent from the Red Rock Water Pollution Control Plant

TABLE:69 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN GREAT LAKES FOREST PRODUCTS LIMITED, DRYDEN, EFFLUENT AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DMDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHAN SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
AUGUST 23,1982:																						
FINAL EFFLUENT	65	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	30	ND	12	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED

TABLE:70 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN GREAT LAKES FOREST PRODUCTS LIMITED, THUNDER BAY, EFFLUENT AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DMDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHATE SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
JUNE 8,1982:																						
FINAL EFFLUENT	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED

TABLE:71 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN JAMES RIVER MARATHON LTD.,(FORMERLY AMERICAN CAN CANADA INC.), EFFLUENTS AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DHDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHAN SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
JUNE 22,1982:																						
FINAL EFFLUENT	2210	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MAIN MILL EFFLUENT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACIDIC SEWER EFFLUENT	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
ALKALINE SEWER EFFLUENT	90	ND	11	ND	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUGUST 16,1982:																						
FINAL EFFLUENT	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED

TABLE:72 POLYCHLORINATED BIPHENYLS (PCB'S) AND ORGANOCHLORINE PESTICIDES IN KIMBERLY-CLARK OF CANADA LIMITED, TERRACE BAY, EFFLUENT AND MILL INTAKE WATER.

CONCENTRATIONS (NG/L = PPT) OF PCB'S AND ORGANOCHLORINE PESTICIDES

DATE SAMPLED/ SAMPLE DESCRIPTION	PCB'S TOTAL	ALDRIN	ALPHA-BHC	BETA-BHC	GAMMA-BHC	ALPHA-CHLORDANE	GAMMA-CHLORDANE	DIELDRIN	DMDT-METHOXYCHLOR	ENDOSULPHAN 1	ENDOSULPHAN 2	ENDRIN	ENDOSULPHAN SULPHATE	HEPTACHLOR EPOXIDE	HEPTACHLOR	MIREX	OXYCHLORDANE	OP-DDT	PP-DDD	PP-DDE	PP-DDT	HEXACHLOROBENZENE
AUGUST 10,1982:																						
FINAL EFFLUENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MILL INTAKE WATER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DETECTION LIMIT	20	1	1	1	1	2	2	2	5	2	4	4	4	1	1	5	2	5	5	1	5	1

ND -NOT DETECTED
-- -NOT AVAILABLE

APPENDIX C

Table 1: Preliminary List of Trace Contaminants of Concern which should be included for Monitoring Pulp and Paper Mill Effluents in Ontario*

CONTAMINANTS	CONCERN
Aluminum	criteria in development, high in waste metals
Benzene	moderately toxic(a), low bioaccumulation(b), non-persistent(c), animal and suspect human carcinogen
Bromodichloromethane	mutagen
Cadmium	extremely toxic, moderately bioaccumulative
Carbon Tetrachloride	slightly toxic, non-persistent, animal and suspect human carcinogen
Chloroacetaldehyde	mutagen
Chlorodehydroabietic Acids	toxic, persistent
Chloroform	slightly toxic, non-persistent, animal and suspect human carcinogen
Chlorofuranone	mutagen
Chloropropenal	mutagen
Copper	regulated
Dehydroabietic Acid	toxic, persistent
Dibutyl Phthalate	human health
Dichloroacetone	mutagen
Dichloroethane	slightly toxic, non-persistent, animal carcinogen
Dichloromethane	mutagen
Fatty Acids	toxic
Hexachloroacetone	mutagen
Lead	extremely toxic
Mercury	extremely toxic, highly bioaccumulative
Neoabietic Acid	mutagen
Pentachloroacetone	mutagen
Pentachlorophenol	extremely toxic, very persistent
Pentachloropropene	mutagen
Phenols	toxic, impair flavour
PCBs	high bioaccumulation, very persistent
PCDDs	animal carcinogens
PCDFs	potential animal carinogens
Resin Acids	toxic
2,3,7,8-TCDD	animal carcinogen & teratogen
Tetrachloroacetone	mutagen
Tetrachloroethene	mutagen
Tetrachloroguaiacol	toxic, persistent
Tetrachloropropene	mutagen
Toluene	moderately toxic, non-persistent, cancer promoter
Trichloroacetone	mutagen
Trichloroethane	moderately toxic, non-persistent, 1,1,1-isomer: mutagen; 1,1,2-isomer: carcinogen
Trichloroethene	mutagen
Trichloroguaiacol	toxic, persistent
Trichlorophenol	extremely toxic, persistent, 2,4,6-isomer: possible animal carcinogen
Zinc	regulated

* = prepared by Cecil Inniss, MOE (unpublished)
(a) = toxic to aquatic biota
(b) = bioaccumulates in aquatic biota
(c) = persistent in the aquatic environment
PCBs = Polychlorinated biphenyls
PCDDs = Polychlorinated dibenzodioxins
PCDFs = Polychlorinated dibenzofurans
TCDD = Tetrachlorodibenzodioxin

APPENDIX D

ABBREVIATIONS & SYMBOLS:

A	Approximately
ACGIH	American Conference of Governmental Industrial Hygienists
APFP	Abitibi Price Fine Papers, Port Arthur Division
APFW	Abitibi Price Inc., Fort William Division
APTB	Atibiti Price Inc., Thunder Bay Division
BAT	Best Available Technology Economically Achievable
BHC	Hexachlorocyclohexane
BOD	Biological Oxygen Demand
BOISE	Boise Cascade Canada Ltd.
COA	Canada - Ontario Agreement Respecting Great Lakes Water Quality
COD	Chemical Oxygen Demand
CP	Chlorophenols
CPAR	Committee on Pollution Abatement Research
DCP	Dichlorophenols
DOC	Dissolved Organic Carbon
DOMTAR	Domtar Packaging/Kraft Paper and Board Division, Red Rock Mill
E. coli	Escherichia coli
FTU	Formazin Turbidity Units
GC/MS	Gas Chromatography/Mass Spectrometry
GLFP	Great Lakes Forest Products Ltd., (Dryden)
GLFPTB	Great Lakes Forest Products Ltd., (Thunder Bay)
GLWQA	Great Lakes Water Quality Agreement
HZ	Hazen Units
IJC	International Joint Commission
JR	James River Marathon Ltd.
KC	Kimberly-Clark of Canada Ltd.
LC50	Lethal Concentration 50
MOE	Ontario Ministry of the Environment
mg/L	Milligrams/Litre
mL	Millilitres
N	Number of Samples
NA	Not Available

ABBREVIATIONS & SYMBOLS: (Cont'd)

ND	Not Detected
NL	Non Lethal
ng/L	Nanograms/Litre
P & P	Pulp and Paper
PCB	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzodioxins
PCDF	Polychlorinated dibenzofurans
PCP	Pentachlorophenols
PPB	Parts Per Billion
PPM	Parts Per Million
PPT	Parts Per Trillion
PWQO	Provincial Water Quality Objective
SCMP	Semi Chemical Mechanical Pulping
SU	Standard Units
TCDD	Tetrachlorodibenzodioxin
TCP	Trichlorophenols
TKN	Total Kjeldahl Nitrogen
TP	Total Phosphorus
TS	Total Solids
TSS	Total Suspended Solids
TTCP	Tetrachlorophenols
USDHHS	United States Department of Health and Human Services
USEPA	United States Environmental Protection Agency
µg/L	Micrograms/Litre
µs/cm	Microsiemens/Centimetre
--	Not Available
<	Less Than
>	Greater Than
%	Percent